(12)

ASD-TR-80-5036

METHOD FOR GENERATING A RANDOMIZED FLIGHT-BY-FLIGHT LOADING SEQUENCE FOR AN AIRCRAFT

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JULY 1980

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AERONAUTICAL SYSTEMS DIVISION
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
ASD-TR-80-5036

2. GOVT ACCESSION NO.
AD-112 101

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Method for Generating a Randomized Flight-by-Flight Loading Sequence for an Aircraft

5. TYPE OF REPORT & PERIOD COVERED
Final Report

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
John W. Lincoln

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Aeronautical Systems Division (ASD/ENFS)
Wright-Patterson AFB, OH 45433

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
Aeronautical Systems Division (ASD/ENFS)
Wright-Patterson AFB, OH 45433

12. REPORT DATE
July 1980

13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release, distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
Jack N. Hoffman
JACK N. HOFFMAN
STINFO Officer
Flight Systems Engineering

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Flight-by-Flight Sequence
Randomized Loading
Flight Loads
Ground Loads
Temperature Profile

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report provides a technique for obtaining a flight-by-flight loading sequence that could be used in fracture and fatigue analyses and in durability and damage tolerance testing of an aircraft. The major load producing events (i.e. take-off taxi, flight, touch and go landings, landing, and landing taxi) are considered sequentially. The missions in which these events occur can be drawn randomly or put in a predetermined order. The loadings within each event are obtained randomly. The flight loads (include both maneuver loads and gusts) are assumed to be derived from flight recorder data or from a (Con't on reverse)
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DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Block 20 (Con't)

specific mission profile. In both cases the flight portion is divided into intervals to account for separate phases of the mission and weight changes during flight. In addition an aircraft temperature profile associated with the mission is randomly sampled to provide a flight-by-flight temperature sequence. To provide more flexibility in deriving the flight-by-flight sequence the mission time can be obtained by a random sampling. The computer program for generating the flight-by-flight sequence is included along with a sample problem.

FOREWORD

This report was prepared by John W. Lincoln, Structures Division of the Directorate of Flight Systems Engineering. The work was done as a research and development task for general use for generating flight-by-flight loading spectra for aircraft.

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LIST OF SYMBOLS

N_p	Number of control points on the aircraft structure used in deriving the fatigue test spectrum
N_m	Number of different missions flown by the test aircraft in its life
σ_R^{ab}	Stress at the ath control point for the aircraft resting on its landing gear ready to fly the bth mission.
$M_{TT_p}^{ab}$	The number of different stresses in the maximum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{TT_p}^{ab}$	A simple graph, the ordinates of which are members of the maximum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{TT_p}^{abm}$	A simple graph whose ordinates are the number of take-off taxi load maximums during one lifetime for the stresses contained in $\sigma_{TT_p}^{ab}$ before the mth random sampling
$n_{TT_{p_T}}^{abm}$	The sum of the ordinates of $n_{TT_p}^{abm}$
$n_{TT_p}^{abm}$	A simple graph derived from $n_{TT_p}^{abm}$ whose ordinates are the selection candidates in the random sampling process
$M_{TT_n}^{ab}$	The number of different stresses in the minimum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{TT_n}^{ab}$	A simple graph, the ordinates of which are members of the minimum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{TT_n}^{abm}$	A simple graph whose ordinates are the number of take-off taxi load minimums during one lifetime for the stresses contained in $\sigma_{TT_p}^{ab}$ before the mth random sampling

$n^{amb}_{TT_{n_T}}$ The sum of ordinates of $n^{abm}_{TT_n}$

$n^{abm}_{TT_n}$ A simple graph derived from $n^{abm}_{TT_n}$ whose ordinates are the selection candidates in the random sampling process

N_S^b *The number of mission intervals (in flight) in the bth mission*

$M^{abc}_{F_p}$ The number of different stresses in the maximum flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

$\sigma^{abc}_{F_p}$ A simple graph, the ordinates of which are members of the maximum flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

$n^{abcm}_{F_p}$ A simple graph whose ordinates are the number of flight load maximums during one lifetime for the stresses contained in $\sigma^{abc}_{F_p}$ before the mth random sampling

$n^{abcm}_{F_{p_T}}$ The sum of the ordinates of $n^{abcm}_{F_p}$

$n^{abcm}_{F_p}$ A simple graph derived from $n^{abcm}_{F_p}$ whose ordinates are the selection candidates in the random sampling process

$M^{abc}_{F_n}$ The number of different stresses in the negative g flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

$\sigma^{abc}_{F_n}$ A simple graph, the ordinates of which are members of the negative g flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

$n^{abcm}_{F_n}$ A simple graph whose ordinates are the number of flight negative g loads during one lifetime for the stresses contained in $\sigma^{abc}_{F_n}$ before the mth random sampling

$n_{F_{n_T}}^{abcm}$	The sum of the ordinates of $n_{F_n}^{abcm}$
$n_{F_n}^{abcm}$	A simple graph derived from $n_{F_n}^{abcm}$ whose ordinates are the selection candidates in the random sampling process
$M_{F_g}^{abc}$	The number of different stresses in the one g flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission
$\sigma_{F_g}^{abc}$	A simple graph, the ordinates of which are members of the one g flight stress spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission
$n_{F_g}^{abcm}$	A simple graph whose ordinates are the number of flight one g load during one lifetime for the stresses contained in $\sigma_{F_g}^{abc}$ before the mth random sampling
$n_{F_{g_T}}^{abcm}$	The sum of the ordinates of $n_{F_g}^{abcm}$
$n_{F_g}^{abcm}$	A simple graph derived from $n_{F_g}^{abcm}$ whose ordinates are the selection candidates in the random sampling process
$M_{L_i}^{ab}$	The number of different stresses in the landing impact stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{L_i}^{ab}$	A simple graph, the ordinates of which are members of the landing impact stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{L_i}^{abm}$	A simple graph whose ordinates are the number of landing impact loads during one lifetime for the stresses contained in $\sigma_{L_i}^{ab}$ before the mth random sampling
$n_{L_{i_T}}^{abm}$	The sum of the ordinates of $n_{L_i}^{abm}$

$n_{L_i}^{abm}$ — A simple graph derived from $n_{L_i}^{abm}$ whose ordinates are the selection candidates in the random sampling process

$M_{LT_p}^{ab}$ — The number of different stresses in the maximum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission

$\sigma_{LT_p}^{ab}$ — A simple graph, the ordinates of which are members of the maximum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission

$n_{LT_p}^{abm}$ — A simple graph whose ordinates are the number of maximum landing taxi loads during one lifetime for the stresses contained in the $\sigma_{LT_p}^{ab}$ before the mth random sampling

$n_{LT_{p_T}}^{abm}$ — The sum of the ordinates of $n_{LT_{p_T}}^{abm}$

$n_{LT_p}^{abm}$ — A simple graph derived from $n_{LT_p}^{abm}$ whose ordinates are the selection candidates in the random sampling process

$M_{LT_n}^{ab}$ — The number of different stresses in the minimum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission

$\sigma_{LT_n}^{ab}$ — A simple graph, the ordinates of which are members of the minimum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission

$n_{LT_n}^{abm}$ — A simple graph whose ordinates are the number of minimum landing taxi loads during one lifetime for the stresses contained in $\sigma_{LT_n}^{ab}$ before the mth random sampling

$n_{LT_{n_T}}^{abm}$ — The sum of the ordinates of $n_{LT_n}^{abm}$

$n^{abm}_{LT_{n_T}}$ A simple graph derived from $n^{abm}_{LT_n}$ whose ordinates are the selection candidates in the random sampling process

M^{abc}_F The number of different temperatures in the flight temperature spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

T^{abc}_F A simple graph, the ordinates of which are members of the flight temperature spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission

n^{abcm}_F A simple graph whose ordinates are the number of flight temperature occurrences during one lifetime for the temperatures contained in T^{abc}_F before the mth random sampling

$n^{abcm}_{F_T}$ The sum of the ordinates of n^{abcm}_F

n^{abcm}_F A simple graph derived from n^{abcm}_F whose ordinates are the selection candidates in the random sampling process

$M^{ab}_{TG_i}$ The number of different stresses in the touch-and-go landing impact stress spectrum for the ath control point of an aircraft flying the bth mission

$\sigma^{ab}_{TG_i}$ A simple graph, the ordinates of which are members of the tough-and-go landing impact stress spectrum for the ath control point of an aircraft flying the bth mission

$n^{abm}_{TG_i}$ A simple graph whose ordinates are the number of touch-and-go landing impact loads during one lifetime for the stresses contained in $\sigma^{ab}_{TG_i}$ before the mth random sampling

$n^{abm}_{TG_{i_T}}$ The sum of ordinates of $n^{abm}_{TG_i}$

$n^{abm}_{TG_i}$ A simple graph derived from $n^{abm}_{TG_i}$ whose ordinates are the selection candidates in the random sampling process

$M^{ab}_{TG_g}$ — The number of different stresses in the touch-and-go landing one g stress spectrum for the ath control point of an aircraft flying the bth mission

$\sigma^{ab}_{TG_g}$ — A simple graph, the ordinates of which are members of the touch-and-go landing one g stress spectrum for the ath control point of an aircraft flying the bth mission

$n^{abm}_{TG_g}$ — A simple graph whose ordinates are the number of touch-and-go landing one g loads during one lifetime for the stresses contained in $\sigma^{ab}_{TG_g}$ before the mth random sampling

$n^{abm}_{TG_{g_T}}$ — The sum of ordinates of $n^{abm}_{TG_g}$

$\eta^{abm}_{TG_g}$ — A simple graph derived from $n^{abm}_{TG_g}$ whose ordinates are the selection candidates in the random sampling process

SECTION I

INTRODUCTION

It is now generally accepted that flight-by-flight fatigue testing is more representative of service experience than block type testing. Further, it appears that load randomization within a flight corresponds reasonably well to flight time history measurements. The purpose of this report is to provide a computer technique to transition from exceedance data for various phases of flight to a randomized flight-by-flight loading sequence.

The method is based on the assumption that the exceedance function for stress at a control point of the aircraft has been stepped (i.e. defined in terms of the number of occurrences at a finite number of stresses). One approach for obtaining the stepped exceedance function is described in reference (1). These data are derived for take-off taxi, flight (including all of the mission interval divisons such as ascent, cruise, combat, loiter, and descent), landing impact, touch-and-go landings, and landing taxi and arranged for input to the computer routine. In addition temperature exceedance functions may be placed in the program to provide a temperature corresponding to each stress occurrence.

It is assumed that the stresses and temperatures are randomized within each phase of flight. The ordering of missions flown within a lifetime may be predetermined or determined randomly. In addition, some freedom is allowed in selecting the flight time in a mission randomly. This feature is useful in the case where the exceedance data are derived from flight recorder data.

In all flight phases, the random sampling is done without replacement. As a consequence, the exceedance function derived from the flight-by-flight load sequence is identical with the input exceedance function.

The computer program along with a sample problem is included. This program terminates at the point of writing the flight-by-flight sequence of loads. To be of practical value, the output of this routine will have to put on cards or tape (whatever is required by the specific requirements of the test set-up).

SECTION II

DESCRIPTION OF METHOD

Based on flight recorder data, or for a new design, the mission profiles, the stress spectrum for positive load factors and the stress spectrum for negative load factors can be computed. The method for doing this was developed in Reference 1. These results when combined with gust, landing, and taxi loads can be used to generate the fatigue test loading sequence.

There are two possibilities that will be considered for this sequence. These are

Case 1. - Stress spectra derived from flight recorder data
For this case the basic assumptions are

a. Loading randomized within a specified weight interval and loadings per unit time fixed within an interval

b. Weight intervals treated as nonrandom within a given mission type

c. Mission type treated as random or nonrandom within aircraft life

d. Hours per flight are randomized

e. Temperature treated as random within a given weight interval

Case 2. - Stress spectra derived from the mission profiles
The basic assumptions are

a. Loading randomized within a mission interval and loadings per unit time fixed within a interval

b. Mission intervals treated as nonrandom within a given mission type

c. Mission type treated as random or nonrandom within aircraft life

d. Hours per flight determined from the appropriate mission profile or randomized

e. Temperature treated as random within a given mission interval

For both of these cases the following assumptions will be made

(a) The sampling of the stress spectra will be done without replacement

(b) When treated as a random process the mission type will be sampled without replacement

The flight-by-flight fatigue test loading sequence for a specified mission is developed in the following order:

(a) Aircraft in take-off configuration resting on the landing gear

(b) Take-off taxi load cycles applied for the time appropriate to this phase. It is assumed that the first load is a maximum, then a minimum followed by a maximum etc. Further, it is assumed the last load is a minimum.

(c) The flight load cycles are applied mission or weight (as appropriate) interval by interval for the entire flight. The first loading in flight is a maximum. This is followed by a minimum (either from the population of one g load or the population of less than one g loads). The maximum-minimum-maximum etc. sequence is continued throughout the segment. The last flight load in each segment is assumed to be a minimum. As an option, the time spent in a given flight may be selected randomly. A selection may be made for each mission interval (or weight interval) in a mission.

(d) The landing impact follows the last minimum flight load. This is a one time loading that is derived from a distribution of sink speeds, attitude, etc.

(e) The final part of the loading sequence is the landing taxi. This is a cyclic loading with the first load a maximum followed by a minimum and then another maximum etc. It is assumed that the last load is a minimum. The time spent in landing taxi is that which is appropriate to the mission specified.

For each flight load occurrence in a mission or weight interval there will be an associated temperature derived from the velocity and altitude variations within that segment. It will be assumed that the population of temperatures is independent of the population of loads. Consequently, the sampling of the temperature population does not depend on the loading that has been selected for that time in the mission.

The following definitions describe the functions required to implement this process.

Suppose each of a, b, Np, and Nm a positive integer such that a is in [1, Np] and b is in [1, Nm]. Further, suppose that σ_R^{ab} is the stress at the ath control point for the aircraft resting on its landing gear ready to fly the bth mission.

Suppose that $M_{TT_p}^{ab}$ is a positive integer and $\sigma_{TT_p}^{ab}$ is a simple graph such that the x-projection of $\sigma_{TT_p}^{ab}$ is the set of integers in $[1, M_{TT_p}^{ab}]$ and if i and i+1 are in $[1, M_{TT_p}^{ab}]$ then $\sigma_{TT_p}^{ab}(i)$ is less than $\sigma_{TT_p}^{ab}(i+1)$. $\sigma_{TT_p}^{ab}$ is a finite number sequence with x-projection $[1, M_{TTp}^{ab}]$. Now suppose that i is a positive integer in $[1, M_{TTp}^{ab}]$ and n_{TTp}^{abl} is a simple graph such that the point $(\sigma_{TTp}^{ab}(i),$ $n_{TTp}^{abl}(\sigma_{TTp}^{ab}(i)))$ belongs to n_{TTp}^{abl} only if $n_{TTp}^{abl}(\sigma_{TTp}^{ab}(i))$ is the number of take-off taxi load maximums during one lifetime at the stress $\sigma_{TTp}^{ab}(i)$ for the ath control point of the aircraft flying the bth mission. The total number of these take-off taxi load maximums is

$$n_{TT_{p_T}}^{abl} = \sum_{i=1}^{M_{TTp}^{ab}} n_{TTp}^{abl} \left(\sigma_{TTp}^{ab}(i)\right)$$

Therefore there are $n_{TT_{p_T}}^{abl}$ selection candidates to obtain the the first one of the M_{TTp}^{ab} stresses. A selection is made from the population of integers in $[1, n_{TT_{p_T}}^{ab}]$ on the basis that if i and j are integers in $[1, n^{ab1}_{TT_{p_T}}]$ then the probability of choosing i is equal to the probability of choosing j. Now, suppose that n^{ab1}_{TTp} is a simple graph with x-projection zero plus the set of integers in $[1, M^{ab}_{TT_p}]$. Also, $n^{ab1}_{TTp}(o) = 0$ and if i is in $[1, M^{ab}_{TTp}]$ then

$$n^{ab1}_{TTp}(i) = \sum_{k=1}^{i} n^{ab1}_{TTp} \; (\sigma^{ab}_{TTp}(k)).$$

Therefore, if j is an integer chosen from the integers in $[1, n^{ab1}_{TT_{p_T}}]$ then there exists a number m such that $n^{ab1}_{TTp}(m-1) < j \le n^{ab1}_{TTp}(m)$.

It is desired to sample the population of integers in $[1, n^{ab1}_{TTp_T}]$ without replacement. Therefore, before the second selection of a maximum stress is made the number of maximums at the stress $\sigma^{ab}_{TTp}(m)$ must be reduced by one. Based on this reduction, the simple graphs n^{ab1}_{TTp} and n^{ab1}_{TTp} are transformed into n^{ab2}_{TTp} and n^{ab2}_{TTp}. It follows then if $n^{ab2}_{TT_{p_T}} = n^{ab1}_{TT_{p_T}} - 1$ and if j is an integer chosen from the integers in $[1, n^{ab2}_{TTp}]$ then there exists a number m such that $n^{ab2}_{TTp}(m-1) < j \le n^{ab2}_{TTp}(m)$. This process can be repeated until all of the maximums have been selected.

Suppose that M^{ab}_{TTn} is a positive integer and σ^{ab}_{TTn} is a finite number sequence with x-projection $[1, M^{ab}_{TTn}]$. Now suppose that i is a positive integer in $[1, M^{ab}_{TTn}]$ and n^{ab1}_{TTn} is a simple graph such that the point

$(\sigma^{ab}_{TTn}(i),\ n^{ab1}_{TTn}\ (\sigma^{ab}_{TTn}(i)))$ belongs to n^{ab1}_{TTn} only if $n^{ab1}_{TTn}\ (\sigma^{ab}_{TTn}(i))$ is the number of take-off taxi load minimums during one lifetime at the stress $\sigma^{ab}_{TTn}(i)$ for the ath control point of the aircraft flying the bth mission. The total number of these take-off taxi load minimums is

$$n^{ab1}_{TT_{n_T}} = \sum_{i=1}^{M^{ab}_{TTn}} n^{ab1}_{TT_n}\ (\sigma^{ab}_{TTn}(i)) = n^{ab1}_{TT_{p_T}}$$

In this case there are the same number of selection candidates as for the take-off taxi load maximums. The selection from the minimums is made on the same basis as from the maximums. Suppose that n^{ab1}_{TTn} is a simple graph with x-projection zero plus the set of integers in $[1,\ M^{ab}_{TTn}]$. Further, suppose that $n^{ab1}_{TTn}(o) = 0$ and if i is in $[1,\ M^{ab}_{TTn}]$ then

$$n^{ab1}_{TTn}(i) = \sum_{k=1}^{i} n^{ab1}_{TTn}\ (\sigma^{ab}_{TTn}(k))$$

Therefore, if j is an integer chosen from the integers in $[1,\ n^{ab1}_{TT_{n_T}}]$ then there exists a number m such that $n^{ab1}_{TT_n}(m-1) < j \le n^{ab1}_{TT_n}(m)$

As in the case of the maximums it is desired to sample the minimums without replacement. Consequently, the simple graphs $n^{ab1}_{TT_n}$ and $n^{ab1}_{TT_n}$ are transformed to $n^{ab2}_{TT_n}$ and $n^{ab2}_{TT_n}$, etc.

Suppose that each of c and N^b_S is a positive integer such that c is in $[1,\ N^b_S]$. Further, suppose that $M^{abc}_{F_p}$ is a positive integer and $\sigma^{abc}_{F_p}$ is a finite number sequence with x-projection $[1,\ M^{abc}_{F_p}]$. Now, suppose that i is a positive integer in $[1,\ M^{abc}_{F_p}]$ and $n^{abc1}_{F_p}$ is a simple graph such that the point $(\sigma^{abc}_{F_p(i)}, n^{abcl}_{F_p}(\sigma^{abc}_{F_p(i)}))$ belongs to $n^{abcl}_{F_p}$ only if $n^{abcl}_{F_p}(\sigma^{abc}_{F_p(i)})$ is the number of flight "positive g loads" during one lifetime at the stress $\sigma^{abc}_{F_p(i)}$ for the ath control point of the airplane flying the cth interval of the bth mission. The term "positive g loads" refers to those maximum load occurrences corresponding to n_z in excess of one.

The total number of these positive g loads is

$$n^{abcl}_{F_{p_T}} = \sum_{i=1}^{M^{abc}_{F_p}} n^{abcl}_{F_p} (\sigma^{abc}_{F_{p(i)}})$$

For the first load selection after take-off there are $n^{abl1}_{F_p}$ selection candidates to obtain one of $M^{abl}_{F_p}$ stresses. A selection is made from the population of integers in $[1, n^{abl1}_{F_{pT}}]$ on an equal probability basis (as for the taxi). Now, suppose that $n^{abcl}_{F_p}$ is a simple graph with x-projection zero plus the set of integers in $[1, M^{abc}_{F_p}]$. Also, $n^{abcl}_{F_p(o)} = o$ and if i is in $[1, M^{abc}_{F_p}]$ then

$$n^{abcl}_{F_{p(i)}} = \sum_{k=1}^{i} n^{abcl}_{F_p} (\sigma^{abc}_{F_p}(k)).$$

Thus, if j is an integer chosen from the integers in $[1, n^{abl1}_{F_{p_T}}]$ then there exists a number m such that $n^{abl1}_{F_p(m-1)} < j \le n^{abl1}_{F_p(m)}$.

This population is also sampled segment by segment without replacement until all of the maximums are selected.

Suppose that $M_{F_n}^{abc}$ is a positive integer and $\sigma_{F_n}^{abc}$ is a finite number sequence with x-projection $[1, M_{F_n}^{abc}]$. Further, suppose that i is a positive integer in $[1, M_{F_n}^{abc}]$ and $n_{F_n}^{abc1}$ is a simple graph such that the point $(\sigma_{F_n}^{abc}(i), n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i)))$ belongs to $n_{F_n}^{abc1}$ only if $n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i))$ is the number of "negative g loads" during one lifetime at the stress $\sigma_{F_n}^{abc}(i)$ for the ath control point of the airplane flying the cth interval of the bth mission. The term "negative g loads" refers to those minimum load occurrences corresponding to n_z less than one.

The total number of these negative g loads is

$$n_{F_{n_T}}^{abc1} = \sum_{i=1}^{M_{F_n}^{abc}} n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i))$$

It is assumed that each positive g loading is followed by either a negative g load or by a "one g load" (a "one g load" is a load corresponding to an n_z minimum equal to one).

The total number of one g loads for the ath control point of the aircraft flying the cth interval of the bth mission is

$$n_{F_{g_T}}^{abc1} = n_{F_{p_T}}^{abc1} - n_{F_{n_T}}^{abc1}$$

The stress spectrum for the one g loads will be derived from the velocity, altitude, and weight interval load occurrences that were used for the positive g load stress spectrum. It is assumed that for each load occurrence the normal load factor will be equal to one. To obtain the correct number of minimums from this spectrum, the number of loadings at each stress level will have to be multiplied by the ratio $n^{abcl}_{F_{g_T}}/n^{abcl}_{F_{p_T}}$. The resultant one g maneuver load spectrum can be defined as follows:

Suppose M^{abc}_{Fg} is a positive integer and σ^{abc}_{Fg} is a finite number sequence with x-projection the interval $[1, M^{abc}_{Fg}]$. Also, suppose that i is an integer in $[1, M^{abc}_{Fg}]$ and n^{abcl}_{Fg} is a simple graph such that the point $(\sigma^{abc}_{Fg}(i), n^{abcl}_{Fg}(\sigma^{abc}_{Fg}(i)))$ belongs to n^{abcl}_{Fg} only if $n^{abcl}_{Fg}(\sigma^{abc}_{Fg}(i))$ is the number of "one g loads" during one lifetime at the stress $\sigma^{abc}_{Fg}(i)$ for the ath control point of the airplane flying the cth interval of the bth mission. Note that

$$n^{abcl}_{F_{g_T}} = \sum_{i=1}^{M^{abc}_{F_g}} n^{abcl}_{F_g} \left(\sigma^{abc}_{F_g}(i)\right)$$

The selection of the flight load minimum is complicated by the fact that it may come from one of the negative g loads or it may come from one of the one g loads. This condition may be handled as follows: Suppose n^{abcl}_{Fn} is a simple graph with x-projection zero plus the set of integers in $[1, M^{abc}_{Fg} + M^{abc}_{Fn}]$. If i is in $[1, M^{abc}_{Fg}]$ then $n^{abcl}_{Fn}(i)$ is $\sum_{k=1}^{i} n^{abcl}_{Fg}(\sigma^{abc}_{Fg}(k))$. If i is in $[M^{abc}_{Fg} + 1, M^{abc}_{Fg} + M^{abc}_{Fn}]$ then $n^{abcl}_{Fn}(i)$ is

$n^{abcl}_{Fg_T} + \sum_{k=1}^{i - M_{Fg}} n^{abcl}_{Fn}(\sigma^{abc}_{Fn}(k))$. Also, $n^{abcl}_{Fn}(o) = o$. Therefore, for the first flight load minimum selection, if j is an integer chosen from the integers in [1, $n_{Fp_T}^{ab11}$] then there exists a number m such that $n_{Fn}^{ab11}(m-1) < j \leq n_{Fn}^{ab11}(m)$. Again, the sampling is made without replacement so that the number of minimums is reduced by one. The transformations of n_{Fg}^{ab11}, n_{Fn}^{ab11}, and n_{Fn}^{ab12} to n_{Fg}^{ab12}, n_{Fn}^{ab12}, and n_{Fn}^{ab12} follows from this reqirement. This population is sampled segment by segment until all of the minimums are drawn.

The landing impact stress spectrum will be sampled once per flight without replacement. This spectrum can be defined as follows: Suppose $M_{L_i}^{ab}$ is a positive number and $\sigma_{L_i}^{ab}$ is a finite number sequence with x-projection [1, $M_{L_i}^{ab}$]. Further, suppose j is a positive integer in [1, $M_{L_i}^{ab}$] and $n_{L_i}^{ab1}$ is a simple graph such that the point ($\sigma_{L_i}^{ab}$ (j), $n_{L_i}^{ab1}$ ($\sigma_{L_i}^{ab}$ (j)) belongs to $n_{L_i}^{ab1}$ only if $n_{L_i}^{ab1}$ ($\sigma_{L_i}^{ab}$ (j)) is the number of landing impact minimums during one lifetime at the stress σ_{L_i}(j) for the ath control point of the airplane flying the bth mission.

Suppose that $M_{LT_p}^{ab}$ is a positive integer and $\sigma_{LT_p}^{ab}$ is a finite number sequence with x-projection [1, $M_{LT_p}^{ab}$]. Further, suppose that i is a positive integer in [1, $M_{LT_p}^{ab}$] and $n_{LT_p}^{ab1}$ is a simple graph such that the point ($\sigma_{LT_p}^{ab}$(i), $n_{LT_p}^{ab1}$ (σ_{LT_p}(i))) belongs to $n_{LT_p}^{ab}$ only if $n_{LT_p}^{ab}$ ($\sigma_{LT_p}^{ab}$(i)) is the number of landing taxi load maximums during one lifetime at the stress $\sigma_{LT_p}^{ab}$(i) for the ath control point of the aircraft flying the bth mission. The total number of these maximums is

$$n^{abl}_{LT_{p_T}} = \sum_{i=1}^{M^{ab}_{LT_p}} n^{abl}_{LT_p} \left(\sigma^{ab}_{LT_p}(i)\right).$$

The landing taxi stress selection is analogous to that selection used for the take-off stresses. In this case there are $n^{abl}_{LT_{p_T}}$ selection candidates to obtain the first one of the $M^{ab}_{LT_p}$ stresses. This selection is made on an equal probability basis. Now suppose that $\eta^{abl}_{LT_p}$ is a simple graph with x-projection zero plus the set of integers in $[1, M^{ab}_{LT_p}]$. Also, $\eta^{abl}_{LT_p}(o) = 0$ and if i is in $[1, M^{ab}_{LT_p}]$ then

$$\eta^{abl}_{LT_p}(i) = \sum_{k=1}^{i} n^{abl}_{LT_p} \left(\sigma^{ab}_{LT_p}(k)\right)$$

The simple graph $\eta^{abl}_{LT_p}$ is used to determine the stress that corresponds to the selection from the $n^{abl}_{LT_{p_T}}$ integers.

Again, the sampling is done without replacement until the entire population has been selected.

Suppose $M^{ab}_{LT_n}$ is a positive integer and $\sigma^{ab}_{LT_n}$ is a finite number sequence with x-projection $[1, M^{ab}_{LT_n}]$. Further, suppose that i is a positive integer in $[1, M^{ab}_{LT_n}]$ and $n^{abl}_{LT_n}$ is a simple graph such that the point $(\sigma^{ab}_{LT_n}(i), n^{abl}_{LT_n}(\sigma^{ab}_{LT_n}(i)))$ belongs to $n^{abl}_{LT_n}$ only if $n^{ab}_{LT_n}(\sigma^{ab}_{LT_n}(i))$ is the number of landing taxi load minimums during one lifetime at the stress $\sigma_{LT_n}^{ab}(i)$ for the ath control point of the aircraft flying the bth mission. The total number of these maximums is

$$n_{LT_{n_T}}^{abl} = \sum_{i=1}^{M_{LT_n}^{ab}} n_{LT_n}^{abl} (\sigma_{LT_n}(i))$$

The minimum stress selection is made on the same basis as the maximum stress selection. For this purpose suppose that $n_{LT_n}^{abl}$ is a *simple graph with x-projection zero plus the set of integers* in $[1, M_{LT_n}^{ab}]$. Also, $n_{LT_n}^{abl}(o) = 0$ and if i is in $[1, M_{LT_n}^{ab}]$ then

$$n_{LT_n}^{abl}(i) = \sum_{k=1}^{i} n_{LT_n}^{abl} (\sigma_{LT_n}^{ab}(k))$$

The sampling for the minimum stresses is done without replacement until all of the candidates have been selected.

To include the temperature effects on the test, the following functions need to be defined. Suppose that M_F^{abc} is a positive integer and T_F^{abc} is a finite number sequence with x-projection $[1, M_F^{abc}]$. Further, suppose that i is a positive integer in $[1, M_F^{abc}]$ and n_F^{abcl} is a simple graph such that the point $(T_F^{abc}(i), n_F^{abcl}(T_F^{abc}(i)))$ belongs to n_F^{abcl} only if $n_F^{abcl}(T_F^{abc}(i))$ is the number of occurrences during one lifetime of the temperature $T_F^{abc}(i)$ at the ath control point of the airplane flying the cth interval of the bth mission.

The total number of these temperature occurrences must agree with the number of load occurrences. That is,

$$n_{F_T}^{abcl} = \sum_{i=1}^{M_F^{abc}} n_F^{abcl}(T_F^{abc}(i)) = 2n_{F_{p_T}}^{abcl}$$

The temperature sampling is made without replacement first from the set of integers in $[1, n_{F_T}^{abll}]$. For this purpose suppose n_F^{abcl} is a simple graph with x-projection zero plus the set of integers in $[1, M_F^{abc}]$. Also, $n_F^{abcl}(o) = 0$ and if i is in $[1, M_F^{abc}]$ then

$$n_F^{abcl}(i) = \sum_{k=1}^{i} n_F^{abcl}(T_F^{abc}(k))$$

Therefore, if j is an integer chosen from the integers in $[1, n_{F_T}^{abll}]$ then there exists a number m such that

$$n_F^{abll}(m-1) < j \leq n_F^{abll}(m)$$

This population is sampled segment by segment until all temperatures have been selected.

The special case of the touch-and-go landing must be considered. For this case it is assumed that there are two loads. First, there is a landing impact load followed by a "one g" load. The first touch-and-go in a given mission is assumed to be preceded by a flight load minimum. If there are repeated touch-and-go landings it is assumed that there are no flight loads between them.

The required functions for this case are defined as follows: Suppose $M_{TG_i}^{ab}$ is a positive integer and $\sigma_{TG_i}^{ab}$ is a finite number sequence with x-projection $[1, M_{TG_i}^{ab}]$. Further suppose that j is a positive integer in $[1, M_{TG_i}^{ab}]$ and $n_{TG_i}^{abl}$ is a simple graph such that the point $(\sigma_{TG_i}^{ab}(j), n_{TG_i}^{abl}(\sigma_{TG_i}(j)))$ belongs to $n_{TG_i}^{abl}$ only if $n_{TG_i}^{abl}(\sigma_{TG_i}^{ab}(j))$ is the number of touch-and-go landing impact loads during one lifetime at the stress $\sigma_{TG_i}^{ab}(j)$ for the ath control point of the aircraft flying the bth mission. The total number of these landing impact loads is

$$n^{abl}_{TG_{i_T}} = \sum_{j=1}^{M^{ab}_{TG_i}} n^{abl}_{TG_i} (\sigma^{ab}_{TG_i}(j))$$

Now, suppose that $n^{abl}_{TG_i}$ is a simple graph such that the x-projection of $n^{abl}_{TG_i}$ is zero plus the integers in $[1, M^{ab}_{TG_i}]$. Also, $n^{abl}_{TG_i}(o) = 0$ and if j is in $[1, M^{ab}_{TG_i}]$ then

$$n^{abl}_{TG_i}(j) = \sum_{k=1}^{j} n^{abl}_{TG_i} (\sigma^{ab}_{TG_i}(k))$$

The sampling of the population of integers in $[1, n^{abl}_{TG_{i_T}}]$ is made without replacement as in the case of the previously defined normal landing impact.

For the following one g load suppose that $M^{ab}_{TG_g}$ is a positive integer and $\sigma^{ab}_{TG_g}$ is a finite number sequence with x-projection $[1, M^{ab}_{TG_g}]$. Further, suppose that i is a positive integer in $[1, M^{ab}_{TG_g}]$ and $n^{abl}_{TG_g}$ is a simple graph such that the point $(\sigma^{ab}_{TG_g}(i), n^{abl}_{TG_g} (\sigma_{TG_g}(i)))$ belongs to $n^{abl}_{TG_g}$ only if $n^{abl}_{TG_g} (\sigma^{ab}_{TG_g}(i))$ is the number of one g load conditions (after a touch-and-go landing) during one lifetime at the stress $\sigma^{ab}_{TG_g}(i)$ for the ath control point of the aircraft flying the bth mission.

The total number of these loads must be the same as the touch-and-go impact loads. Therefore

$$n^{abl}_{TG_{g_T}} = \sum_{i=1}^{M^{ab}_{TG_g}} n^{abl}_{TG}(\sigma^{ab}_{TG_g}(i)) = n^{abl}_{TG_{i_T}}$$

To fascillitate the sampling process suppose that $n_{TG_g}^{abl}$ is a simple graph such that the x-projection of $n_{TG_g}^{abl}$ is zero plus the set of integers in $[1, M_{TG_g}^{ab}]$. Further $n_{TG_g}^{abl}(o) = 0$ and if i is in $[1, M_{TG_g}^{ab}]$ then

$$n_{TG_g}^{abl}(i) = \sum_{k=1}^{i} n_{TG_g}^{abl}(\sigma_{TG_g}^{ab}(k))$$

The sampling of the population of integers in $[1, n_{TG_g}^{abl}]$ is made without replacement.

SECTION III

DESCRIPTION OF COMPUTER PROGRAM

1 NOTATION

NCASE = 1 if flight maneuver stress spectra is derived from recorded data

= 2 if flight maneuver stress spectra is derived from mission profiles

NM - Number of missions

NRANM = 1 if missions are randomly selected

= 2 if mission selection is nonrandom

NMTMS = 1 if the number of maximum flight load occurrences per mission is nonrandom. If NMTMS >1 then NMTMS is the number of possible candidates for random selection of the number of maximum flight load occurrences per mission

NFLT - Number of flights in one lifetime

NHRS - Number of flight hours in one lifetime

MISRPT - Number of times a mission sequence occurs in a lifetime (for nonrandom mission selection)

MNUMS - Number of different mission selections in a sequence (for nonrandom mission selection)

NS(i) - Number of mission intervals in the ith mission (excluding take-off and landing)

NTG(i) - Number of touch-and-go landings in the ith mission

NTEMP(i) = 1 if a temperature profile is not included in the ith mission

= 2 if a temperature profile is included in the ith mission

NTTF(i) - Number of maximum take-off taxi load occurrences per flight for the ith mission

NFF(k,i,j) - Number of maximum flight load occurrences per flight for the kth selection from NMTMS possible candidates for the jth interval of the ith mission

NLTF(i) - Number of maximum landing taxi load occurrences per flight for the ith mission

MNUM(i) - The ith mission number selected (nonrandomly) in a mission sequence that occurs MISRPT times in a lifetime

NUMRPT(i) - The number of entries of MNUM(i) within a mission sequence

NFRAC(k, i, j) - Number of times per lifetime that the kth selection from NMTMS possible candidates for the jth interval of the ith mission that the number NFF(k, i, j) is selected

NUMML(i) - Number of times the ith mission occurs in one lifetime

MTTP(i) - Number of maximum take-off taxi load intervals for the ith mission

MTTN(i) - Number of minimum take-off taxi load intervals for the ith mission

MFP(i, j) - Number of positive g load intervals for the jth interval of the ith mission

MFN(i, j) - Number of negative g load intervals for the jth interval of the ith mission

MFG(i, j) - Number of one g load intervals for the jth interval of the ith mission

MLI(i) - Number of landing impact load intervals for the ith mission

MLTP(i) - Number of maximum landing taxi load intervals for the ith mission

MLTN(i) - Number of minimum landing taxi load intervals for the ith mission

MF(i, j) - Number of temperature intervals for the jth interval of the ith mission

MTGI(i) - Number of touch-and-go landing impact load intervals for the ith mission

MTGG(i) - Number of touch-and-go landing one g load intervals for the ith mission

NTTP(i, j) - Number of maximum take-off taxi load occurrences in the jth load interval for the ith mission

NTTN(i, j) - Number of minimum take-off taxi load occurrences in the jth load interval for the ith mission

NFP(i, j, k) - Number of positive g load occurrences in the kth load interval for the jth interval of the ith mission

NFN(i, j, k) - Number of negative g load occurrences in the kth load interval for the jth interval of the ith mission

NFG(i, j, k) - Number of one g load occurrences in the kth load interval for the jth interval of the ith mission

NLI(i, j) - Number of landing impact load occurrences in the jth load interval for the ith mission

NLTP(i, j) - Number of maximum landing taxi load occurrences in the jth load interval for the ith mission

NLTN(i, j) - Number of minimum landing taxi load occurrences in the jth load interval for the ith mission

NF(i, j, k) - Number of temperature occurrences in the kth temperature interval for the jth interval of the ith mission

NTGI(i, j) - Number of touch-and-go landing impact load occurrences per lifetime in the jth load interval for the ith mission

NTGG(i, j) - Number of touch-and-go landing one g load occurrences per lifetime in the jth load interval for the ith mission

TL - Temperature for all ground load conditions

SR(i) - Stress for the take-off configuration for the ith mission (aircraft resting on the landing gear)

STTP(i, j) - Stress in the jth maximum take-off taxi load interval for the ith mission

STTN(i,j) - Stress in the jth minimum take-off taxi load interval for the ith mission

SFP(i, j, k) - Stress in the kth positive g flight load interval for the jth interval of the ith mission

SFN(i, j, k) - Stress in the kth negative g flight load interval for the jth interval of the ith mission

SFG(i, j, k) - Stress in the kth one g flight load interval for the jth interval of the ith mission

SLI(i, j) - Stress in the jth landing impact load interval for the ith mission

SLTP(i, j) - Stress in the jth maximum landing taxi load interval for the ith mission

SLTN(i, j) - Stress in the jth minimum landing taxi load interval for the ith mission

TF(i, j, k) - Temperature in the kth flight temperature interval for the jth interval of the ith mission

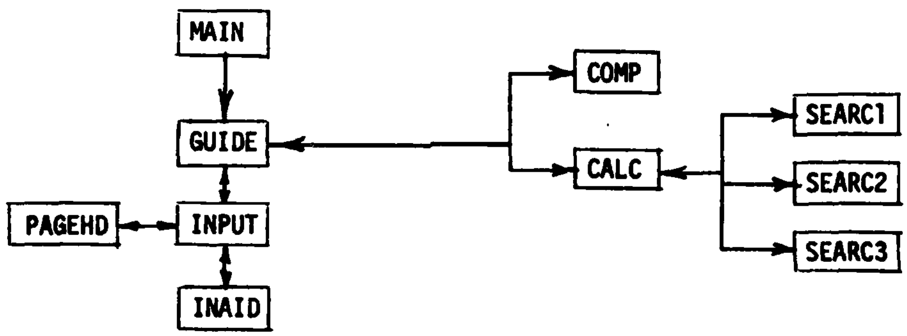
STGI(i, j) - Stress in the jth touch-and-go landing impact load interval for the ith mission

STGG(i, j) - Stress in the jth touch-and-go one g load interval for the ith mission

2 COMPUTER FLOW DIAGRAM AND PROGRAMS

The computer routine was coded in FORTRAN Extended Language with the main program and subroutines arranged as follows:

SPECF Program (See Appendix A)



MAIN - Main Program - Sets NZERO to zero and transfers control to GUIDE

GUIDE - Subroutine - Initially zeros input and output numbers and after first case zeros output numbers before the calculations are performed GUIDE is the subroutine for transferring control to INPUT, COMP, and CALC in turn.

INPUT - Subroutine - Reads in all input data. The details of the data input are discussed later in this section

INAID - Subroutine - Called by INPUT to write certain input data. INAID sets NZERO = 1 for control in GUIDE

PAGEHD - Subroutine - Writes out page heading including run identification, date, and page number

COMP - Subroutine - Checks the input data for compatibility as follows:

For i in [1, NM]

$$NTTF(i) \cdot NUMML(i) = \sum_{j=1}^{MTTP(i)} NTTP(i, j)$$

$$NTTF(i) \cdot NUMML(i) = \sum_{j=1}^{MTTN(i)} NTTN(i, j)$$

$$NUMML(i) = \sum_{j=1}^{MLI(i)} NLI(i, j)$$

$$NLTF(i) \cdot NUMML(i) = \sum_{j=1}^{MLTP(i)} NLTP(i, j)$$

$$NLTF(i) \cdot NUMML(i) = \sum_{j=1}^{MLI(i)}$$

$$NTG(i) \cdot NUMML(i) = \sum_{j=1}^{MTGI(i)} NTGI(i, j)$$

$$NTG(i) \cdot NUMML(i) = \sum_{j=1}^{MTGG(i)} NTGG(i, j)$$

$$NFLT = \sum_{i=1}^{NM} NUMML(i)$$

For j in [1, NS(i)]

$$\sum_{k=1}^{NMTMS} NFF(i, j, k) \cdot NFRAC(i, j, k) = \sum_{k=1}^{MFP(i, j)} NFP(i, j, k)$$

$$\sum_{k=1}^{NMTMS} NFF(i, j, k) \cdot NFRAC(i, j, k) = \sum_{k=1}^{MFN(i, j)} NFN(i, j, k) + \sum_{k=1}^{MFG(i,j)} NFG(i,j,k)$$

If any of the above conditions are violated, an error signal will be printed and GUIDE will be called.

CALC - Subroutine - Computes and prints flight-by-flight load sequence

SEARC1 - Subroutine - Makes random selection of stress where the number of occurrences per lifetime is a one dimensional array

SEARC2 - Subroutine - Makes random selection of stress where the number of occurrences per lifetime is a two dimensional array

SEARC3 - Subroutine - Makes random selection of stress of temperature where the number of occurrences per lifetime is a three dimensional array

3 EQUIVALENCE TABLES

All input numbers for this routine are placed in blank common. All input floating point numbers are called parameters and are contained in P (dimensioned 13,000). All input fixed point numbers are called integers and are contained in N (dimensioned 13,500). To make the program usable, EQUIVALENCE statements are used to give the P and N numbers more recognizable names. The SPECF program parameter and integer tables are given below.

EQUIVALENCE TABLE - P (Parameters)

P	Dim	Term	P	Dim	Term
1	(1)	TL	101	(12)	SR(1)
			111		SR(12)
			115	(12,20)	STTP (1,1)
			354		STTP(12, 20)
			415	(12,20)	STTN (1,1)
			654		STTN(12, 20)
			715	(12, 10, 20)	SFP(1, 1, 1)
			3114		SFP(12, 10,20)
			3115	(12, 10, 20)	SFN(1, 1, 1)
			5514		SFN(12, 10,20)
			5515	(12, 10, 20)	SFG(1, 1, 1)
			7914		SFG(12, 10,20)
			7915	(12, 20)	SLI(1, 1)
			8154		SLI(12, 20)
			8215	(12, 20)	SLTP(1, 1)
			8454		SLTP(12, 20)
			8515	(12, 20)	SLTN(1, 1)
			8754		SLTN(12, 20)
			8815	(12, 10, 20)	TF(1, 1, 1)
			11214		TF(12, 10,20)
			11215	(12, 20)	STGI(1, 1)
			11454		STGI(12, 20)
			11515	(12, 20)	STGG(1, 1)
			11754		STGG(12, 20)
			11815	(300)	STRESS(1)
			12114		STRESS(300)
			12115	(300)	TEMP(1)
			12414		TEMP(300)

EQUIVALENCE TABLE - N (Integer)

N	Dim	Term	N	Dim	Term
1	(1)	IDENT			
2	(1)	NPF1			
3	(1)	NPF2	115	(12, 20)	NTTP(1, 1)
4	(1)	NPF3	354		NTTP(12, 20)
5	(1)	NPF4	415	(12, 20)	NTTN(1, 1)
6	(1)	NPF5	654		NTTN(12, 20)
7	(1)	NPF6	715	(12, 10, 20)	NFP (1, 1, 1)
8	(1)	MONTH	3114		NFP(12,10, 20)
9	(1)	DAY	3115	(12, 10, 20)	NFN(1, 1, 1)
10	(1)	YEAR	5514		NFN(12, 10,20)
11	(1)	NCASE	5515	(12, 10, 20)	NFG(1, 1, 1)
12	(1)	NM	7914		NFG(12,10, 20)
13	(1)	NRANM	7915	(12, 20)	NLI(1, 1)
14	(1)	NMORE	8154		NLI(12, 20)
15	(1)	NMTMS	8215	(12, 20)	NLTP(1, 1)
16	(1)	NFLT	8454		NLTP(12, 20)
17	(1)	NHRS	8515	(12, 20)	NLTN(1, 1)
18	(1)	MISRPT	8754		NLTN(12, 20)
19	(1)	MNUMS	8815	(12, 10, 20)	NF(1, 1, 1)
20	(1)		11214		NF(12, 10,20)
			11215	(12, 20)	NTGI(1, 1)
			11454		NTGI(12, 20)
			11515	(12, 20)	NTGG(1, 1)
			11754		NTGG(12, 20)
			11815	(12)	MTTP(1)
			11826		MTTP(12)
			11830	(12)	MTTN(1)
			11841		MTTN(12)
			11845	(12, 10)	MFP(1, 1)
			11964		MFP(12, 10)
			11965	(12, 10)	MFN(1, 1)
			12084		MFN(12, 10)
			12085	(12, 10)	MFG(1, 1)
			12204		MFG(12, 10)
			12205	(12)	MLI(1)
48	(1)	NZERO	12216		MLI(12)
49	(1)	NPAGE	12220	(12)	MLTP(1)
			12231		MLTP(12)

EQUIVALENCE TABLE - N - (Intege

N	Dim	Term
12235	(12)	MLTN(1)
12246		MLTN(12)
12250	(12, 20)	MF(1, 1)
12369		MF(12, 10)
12370	(12)	MTGI(1)
12381		MTGI(12)
12385	(12)	MTGG(1)
12396		MTGG(12)
12400	(12)	NS(1)
12411		NS(12)
12415	(12)	NTG(1)
12426		NTG(12)
12430	(12)	NTEMP(1)
12441		NTEMP(12)
12445	(12)	NTTF(1)
12456		NTFF(12)
12460	(3, 12, 10)	NFF(1, 1, 1)
12819		NFF(3, 12, 10)
12820	(12)	NLTF(1)
12831		NLTF(12)
12835	(50)	MNUM(1)
12884		MNUM(50)
12885	(50)	NUMRPT(1)
12934		NUMRPT(50)
12935	(3, 12, 10)	NFRAC(1, 1, 1)
13294		NFRAC(3, 12, 10)
13295	(12)	NUMML(1)
13306		NUMML(12)

4 INPUT DATA

All of the input data described below is read into the program by means of the subroutine INPUT. This program is a general purpose routine to read the P (parameters) and N integers. There are several options by which this may be done by this routine. A suggested deck arrangement is given as follows:

14I5 Format

IDENT	1	1	NPF3	0	NPF5	NPF6	MONTH	DAY	YEAR	NCASE	NM	NRANM	0

5I5 Format

NMTMS	NFLT	NHRS	MISRPT	MNUMS

72H Format

Run Description

72H Format

Run Description

3I5 Format

101	100 + NM	1

6E10.3 Format

SR(1) - SR(NM)

I5 E15.7 Format

1	TL

3I5 Format

12400	12399 + NM	1

12I5 Format

NS(1) - NS(NM)

(NS(i) must not exceed 10)

3I5 Format

12415	12414 + NM	1

12I5 Format

NTG(1) - NTG(NM)

3I5 Format

12430	12429 + NM	1

12I5 Format

NTEMP(1) - NTEMP(NM)

3I5 Format

12445	12444 + NM	1

12I5 Format

NTTF(1) - NTTF(NM)

3I5 Format

12820	12819 + NM	1

12I5 Format

NLTF(1) - NLTF(NM)

3I5 Format

13295	13294 + NM	1

12I5 Format

NUMML(1) - NUMML(NM)

If NRANM = 1 go to (bb), if NRANM = 2 go to (aa)

3I5 Format

(aa)

12835	12834 + MNUMS	1

12I5 Format

MNUM(1) - MNUM(MNUMS)

3I5 Format

12885	12884 + MNUMS	1

12I5 Format

NUMRPT(1) - NUMRPT(MNUMS)

(bb) 3I5 Format

11815	11814 + NM	1

12I5 Format

MTTP(1) - MTTP(NM)

(MTTP(i) must not exceed 20)

3I5 Format

11830	11829 + NM	1

12I5 Format

MTTN(1) - MTTN(NM)

(MTTN(i) must not exceed 20)

12205	12204 + NM	1

MLI(1) - MLI(NM)

3I5 Format

12220	12219 + NM	1

12I5 Format

MLTP(1) - MLTP(NM)

3I5 Format

12235	12234 + NM	1

12I5 Format

MLTN(1) - MLTN(NM)

If i is in [1, NM] and NTG(i) = 0 go to (b), otherwise go to (a)

(a) 3I5 Format

12370	12369 + NM	1

12I5 Format

MTGI(1) - MTGI(NM)

(MTGI(i) must not exceed 20)

3I5 Format

12385	12384 + NM	1

12I5 Format

MTGG(1) - MTGG(NM)

(MTGG(i) must not exceed 20)

I5 Format

(b)

NM

7I5 Format

115	1	1	MTTP(1)	1	12	20

6E10.3 Format

STTP(1, 1) - STTP(1, MTTP(1))

⋮

7I5 Format

115	1	1	MTTP(i)	1	12	20

6E10.3 Format

STTP(i, 1) - STTP(i, MTTP(i))

⋮

7I5 Format

115	1	NM	MTTP(NM)	1	12	20

6E10.3 Format

STTP(NM, 1) - STTP(NM, MTTP(NM))

I5 Format

NM

7I5 Format

415	1	1	MTTN(1)	1	12	20

6E10.3 Format

STTN(1, 1) - STTN(1, MTTN(1))

⋮

7I5 Format

415	1	i	MTTN(i)	1	12	20

6E10.3 Format

STTN(i, 1) - STTN(i, MTTN(i))

⋮

7I5 Format

415	1	NM	MTTN(NM)	1	12	20

6E10.3 Format

STTN(NM, 1) - STTN(NM, MTTN(NM))

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

715	1	1	MFP(1, 1)	12	10	20

6E10.3 Format

SFP(1, 1, 1) - SFP(1, 1, MFP(1, 1))

⋮

7I5 Format

715	i	j	MFP(i,j)	12	10	20

6E10.3 Format

SFP(i, j, 1) - SFP(i, j, MFP(i, j))

⋮

7I5 Format

715	NM	NS(NM)	MFP(NM,NS(NM))	12	10	20

6E10.3 Format

SFP(NM, NS(NM),1) - SFP(NM, NS(NM), MFP(NM, NS(NM))

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

3115	1	1	MFN(1, 1)	12	10	20

6E10.3 Format

SFN(1, 1,1) - SFN(1, 1, MFN(1, 1))

⋮

7I5 Format

3115	i	j	MFN(i, j)	12	10	20

6E10.3 Format

SFN(i, j, 1) - SFN(i, j, MFN(i, j))

⋮

7I5 Format

3115	NM	NS(NM)	MFN(NM, NS(NM))	12	10	20

6E10.3 Format

SFN(NM, NS(NM), 1) - SFN(NM, NS(NM), MFN(NM, NS(NM))

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

5515	1	1	MFG(1, 1)	12	10	20

6E10.3 Format

SFG(1, 1, 1) - SFG(1, 1, MFG(1, 1))

⋮

7I5 Format

5515	i	j	MFG(i, j)	12	10	20

6E10.3 Format

SFG(i, j, 1) - SFG(i, j, MFG(i, j))

⋮

7I5 Format

5515	NM	NS(NM)	MFG(NM, NS(NM))	12	10	20

6E10.3 Format

SFG(NM, NS(NM), 1) - SFG(NM, NS(NM), MFG(NM, NS(NM))

I5 Format

$\sum_{i=1}^{NM}$ NS(i) · (NTEMP(i) -1)

If this card entry = 0, omit and go to (d), otherwise go to (c).

(c) 7I5 Format

8815	N1	NS(N1)	MF(N1, NS(N1))	12	10	20

6E10.3 Format

TF(N1, NS(N1), 1) - TF(N1, NS(N1), MF(N1, NS(N1))

⋮

7I5 Format

8815	i	j	MF(i, j)	12	10	20

6E10.3 Format

TF(i, j, 1) - TF(i, j, MF(i, j))

⋮

7I5 Format

8815	N2	NS(N2)	MF(N2, NS(N2))	12	10	20

6E10.3 Format

TF(N2, NS(N2), 1) - TF(N2, NS(N2), MF(N2, NS(N2))

N1 is first mission with NTEMP(N1) = 2

N2 is last mission with NTEMP(N2) = 2

(d) I5 Format

NM

7I5 Format

7915	1	1	MLI(1)	1	12	20

6E10.3 Format

SLI(1, 1) - SLI(1, MLI(1))

⋮

7I5 Format

7915	1	i	MLI(i)	1	12	20

6E10.3 Format

SLI(i, 1) - SLI(i, MLI(i))

⋮

7I5 Format

7915	1	NM	MLI(NM)	1	12	20

6E10.3 Format

SLI(NM, 1) - SLI(NM, MLI(1))

I5 Format

NM

7I5 Format

8215	1	1	MLTP(1)	1	12	20

6E10.3 Format

SLTP(1, 1) - SLTP(1, MLTP(1))

⋮

7I5 Format

8215	1	1	MLTP(1)	1	12	20

6E10.3 Format

SLTP(i, 1) - SLTP(i, MLTP(i))

⋮

7I5 Format

8215	1	NM	MLTP(NM)	1	12	20

6E10.3 Format

SLTP(NM, 1) - SLTP(NM, MLTP(NM))

I5 Format

NM

7I5 Format

8515	1	1	MLTN(1)	1	12	20

6E10.3 Format

SLTN(1, 1) - SLTN(1, MLTN(1))

⋮

7I5 Format

8515	1	i	MLTN(i)	1	12	20

6E10.3 Format

SLTN(i, 1) - SLTN(i, MLTN(i))

⋮

7I5 Format

8515	1	NM	MLTN(NM)	1	12	20

6E10.3 Format

SLTN(NM, 1) - SLTN(NM, MTLN(NM))

I5 Format

N3

N3 is the number of missions that have a touch-and-go landing. If N3 = 0 omit this card and go to (f), otherwise go to (e).

(e) 7I5 Format

11215	1	N4	MTGI(N4)	1	12	20

6E10.3 Format

STGI(N4, 1) - STGI(N4, MTGI(N4))

⋮

7I5 Format

11215	1	i	MTGI(i)	1	12	20

6E10.3 Format

STGI(i, 1) - STGI(i, MTGI(i))

⋮

7I5 Format

11215	1	N5	MTGI(N5)	1	12	20

6E10.3 Format

STGI(N5), 1) - STGI(N5, MTGI(N5))

N4 is first mission with NTG(N4) ≠ 0
N5 is last mission with NTG(N5) ≠ 0

I5 Format

N3

7I5 Format

11515	1	N4	MTGG(N4)	1	12	20

6E10.3 Format

STGG(N4, 1) - STGG(N4, MTGG(N4))

⋮

7I5 Format

11515	1	i	MTGG(i)	1	12	20

6E10.3 Format

STGG(i, 1) - STGG(i, MTGG(i))

⋮

7I5 Format

11515	1	N5	MTGG(N5)	1	12	20

6E10.3 Format

STGG(N5, 1) - STGG(N5, MTGG(N5))

(f) I5 Format

NM·NMTMS

7I5 Format

12460	1	1	NS(1)	3	12	10

12I5 Format

NFF(1, 1, 1) - NFF(1, 1, NS(1))

⋮

7I5 Format

12460	i	j	NS(j)	3	12	10

12I5 Format

NFF(i, j, 1) - NFF(i, j, NS(j))

⋮

7I5 Format

12460	NMTMS	NM	NS(NM)	3	12	10

12I5 Format

NFF(NMTMS, NM, 1) - NFF(NMTMS, NM, NS(NM))

I5 Format

NM·NMTMS

7I5 Format

12935	1	1	NS(1)	3	12	10

12I5 Format

NFRAC(1, 1, 1) - NFRAC(1, 1, NS(1))

⋮

7I5 Format

12935	i	j	NS(j)	3	12	10

12I5 Format

NFRAC(i, j, 1) - NFRAC(i, j, NS(j))

⋮

7I5 Format

12935	NMTMS	NM	NS(NM)	3	12	10

12I5 Format

NFRAC(NMTMS, NM, 1) - NFRAC(NMTMS, NM, NS(NM))

I5 Format

NM

7I5 Format

115	1	1	MTTP(1)	1	12	20

12I5 Format

NTTP(1, 1) - NTTP(1, MTTP(1))

⋮

7I5 Format

115	1	i	MTTP(i)	1	12	20

12I5 Format

NTTP(i, 1) - NTTP(i, MTTP(i))

⋮

7I5 Format

115	1	NM	MTTP(NM)	1	12	20

12I5 Format

NTTP(NM, 1) - NTTP(NM, MTTP(NM))

I5 Format

NM

7I5 Format

415	1	1	MTTN(1)	1	12	20

12I5 Format

NTTN(1, 1) - NTTN(1, MTTN(1))

⋮

4I5	1	i	MTTN(i)	1	12	20

12I5 Format

NTTN(i, 1) - NTTN(i, MTTN(i))

⋮

4I5	1	NM	MTTN(NM)	1	12	20

12I5 Format

NTTN(NM, 1) - NTTN(NM, MTTN(NM))

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

7I5	1	1	MFP(1, 1)	12	10	20

12I5 Format

NFP(1, 1, 1) - NFP(1, 1, MFP(1, 1))

⋮

7I5 Format

7I5	i	j	MFP(i, j)	12	10	20

12I5 Format

NFP(i, j, 1) - NFP(i, j, MFP(i, j))

⋮

7I5 Format

715	NM	NS(NM)	MFP(NM, NS(NM))	12	10	20

12I5 Format

NFP(NM, NS(NM), 1) - NFP(NM, NS(NM), MFP(NM, NS(NM))

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

3115	1	1	MFN(1, 1)	12	10	20

12I5 Format

NFN(1, 1, 1) - NFN(1, 1, MFN(1, 1))

⋮

7I5 Format

3115	i	j	MFN(i, j)	12	10	20

12I5 Format

NFN(i, j, 1) - NFN(i, j, MFN(i, j))

⋮

7I5 Format

3115	NM	NS(NM)	MFN(NM, NS(NM))	12	10	20

12I5 Format

NFN(NM, NS(NM), 1) - NFN(NM, NS(NM), MFN(NM, NS(NM))

I5 Format

$$\sum_{i=1}^{NM} NS(i)$$

7I5 Format

5515	1	1	MFG(1, 1)	12	10	20

12I5 Format

NFG(1, 1, 1) - NFG(1, 1, MFG(1, 1))

⋮

7I5 Format

5515	i	j	MFG(i, j)	12	10	20

12I5 Format

NFG(i, j, 1) - NFG(i, j, MFG(i, j))

⋮

7I5 Format

5515	NM	NS(NM)	MFG(NM, NS(NM))	12	10	20

12I5 Format

NFG(NM, NS(NM), 1) - NFG(NM, NS(NM), MFG(NM, NS(NM))

I5 Format

NM

7I5 Format

7915	1	1	MLI(1)	1	12	20

12I5 Format

NLI(1, 1) - NLI(1, MLI(1))

⋮

7I5 Format

7915	1	i	MLI(i)	1	12	20

12I5 Format

NLI(i, 1) - NLI (i, MLI(i))

⋮

7I5 Format

7915	1	NM	MLI(NM)	1	12	20

12I5 Format

NLI(NM, 1) - NLI(NM, MLI(NM))

I5 Format

NM

7I5 Format

8215	1	1	MLTP(1)	1	12	20

12I5 Format

NLTP(1, 1) - NLTP(1, MLTP(1))

⋮

7I5 Format

8215	1	i	MLTP(i)	1	12	20

1215 Format

NLTP(i, 1) - NLTP(i, MLTP(i))

⋮

7I5 Format

8215	1	NM	MLTP(NM)	1	12	20

12I5 Format

NLTP(NM, 1) - NLTP(NM, MLTP(NM))

I5 Format

NM

7I5 Format

8515	1	1	MLTN(1)	1	12	20

12I5 Format

NLTN(1, 1) - NLTN(1, MLTN(1))

⋮

7I5 Format

8515	1	i	MLTN(i)	1	12	20

12I5 Format

NLTN(i, 1) - NLTN(i, MLTN(i))

⋮

8515	1	NM	MLTN(NM)	1	12	20

12I5 Format

NLTN(NM, 1) - NLTN(NM, MLTN(NM))

I5 Format

$\sum_{i=1}^{NM}$ NS(i)(NTEMP(i) - 1)

If this card entry = 0 omit and go to (h) otherwise go to (g)

(g) 7I5 Format

8815	N1	NS(N1)	MF(N1, NS(N1))	12	10	20

12I5 Format

NF(N1, NS(N1), 1) - NF(N1, NS(N1), MF(N1, NS(N1))

⋮

7I5 Format

8815	i	j	MF(i, j)	12	10	20

12I5 Format

NF(i, j, 1) - NF(i, j, MF(i, j))

⋮

7I5 Format

8815	N2	NS(N2)	MF(N2, NS(N2))	12	10	20

12I5 Format

NF(N2, NS(N2), 1) - NF(N2, NS(N2), MF(N2, NS(N2))

N1 is first mission with NTEMP(N1) = 2

N2 is last mission with NTEMP(N2) = 2

(h) I5 Format

N3

N3 is the number of missions that have a touch-and-go landing. If N3 = 0 omit this card and go to (j) otherwise go to (i).

(i) 7I5 Format

11215	1	N4	MTGI(N4)	1	12	20

12I5 Format

NTGI(N4, 1) - NTGI(N4, MTGI(N4))

⋮

7I5 Format

11215	1	i	MTGI(i)	1	12	20

12I5 Format

NTGI(i, 1) - NTGI(i, MTGI(i))

⋮

7I5 Format

11215	1	N5	MTGI(N5)	1	12	20

12I5 Format

NTGI(N5, 1) - NTGI(N5, MTGI(N5))

N4 is first mission with NTG(N4) ≠ 0

N5 is last mission with NTG(N5) ≠ 0

I5 Format

N3

7I5 Format

11515	1	N4	MTGG(N4)	1	12	20

12I5 Format

NTGG(N4, 1) - NTGG(N4, MTGG(N4))

⋮

7I5 Format

11515	1	i	MTGG(i)	1	12	20

12I5 Format

NTGG(i, 1) - NTGG(i, MTGG(i))

⋮

7I5 Format

11515	1	N5	MTGG(N5)	1	12	20

12I5 Format

NTGG(N5, 1) - NTGG(N5, MTGG(N5))

(j) I5 Format

NM

7I5 Format

11845	1	1	NS(1)	1	12	10

12I5 Format

MFP(1, 1) - MFP(1, NS(1))

⋮

7I5 Format

11845	1	i	NS(i)	1	12	10

12I5 Format

MFP(i, 1) - MFP(i, NS(i))

⋮

7I5 Format

11845	1	NM	NS(NM)	1	12	10

12I5 Format

MFP(NM, 1) - MFP(NM, NS(NM))

I5 Format

NM

7I5 Format

11965	1	1	NS(1)	1	12	10

12I5 Format

MFN(1, 1) - MFN(1, NS(1))

⋮

7I5 Format

11965	1	i	NS(i)	1	12	10

12I5 Format

MFN(i, 1) - MFN(i, NS(i))

⋮

7I5 Format

11965	1	NM	NS(NM)	1	12	10

12I5 Format

MFN(NM, 1) - MFN(NM, NS(NM))

I5 Format

NM

7I5 Format

12085	1	1	NS(1)	1	12	10

12I5 Format

MFG(1, 1) - MFG(1, NS(1))

⋮

7I5 Format

12085	1	i	NS(i)	1	12	10

12I5 Format

MFG(i, 1) - MFG(i, NS(i))

⋮

7I5 Format

12085	1	NM	NS(NM)	1	12	10

12I5 Format

MFG(NM, 1) - MFG(NM, NS(NM))

I5 Format

$$\boxed{\sum_{i=1}^{NM} (NTEMP(i) - 1)}$$

If this entry = 0 omit and go to (1) otherwise go to (k)

(k) 7I5 Format

12250	1	N1	NS(N1)	1	12	10

1215 Format

MF(N1, 1) - MF(N1, NS(N1))

⋮

7I5 Format

12250	1	i	NS(i)	1	12	10

12I5 Format

MF(i, 1) - MF(i, NS(i))

⋮

7I5 Format

12250	1	N2	NS(N2)	1	12	10

12I5 Format

MF(N2, 1) - MF(N2, NS(N2))

N1 is first mission with NTEMP(N1 = 2

N2 is last mission with NTEMP(N2) = 2

(l) END OF FILE

The first card contains fourteen (14) fixed point (integer) numbers arranged in I5 fields. These entries are

(1) IDENT - run number

(2) 1

(3) 1

(4) 11 + 2N + 2L

N = 1 if i is in [1, NM] and NTG(i) ≠ 0

N = 0 otherwise

L = 1 if NRANM = 2

L = 0 if NRANM = 1

(5) 0

(6) 8 + M + 2N

M = 1 if i is in [1, NM] and NTEMP(i) = 2

M = 0 otherwise

(7) 13 + 2M + 2N

(8) MONTH

(9) DAY

(10) YEAR

(11) NCASE

(12) NM

(13) NRANM

(14) 0

The second card contains 5I5 fields with the following entries

(1) NMTMS

(2) NFLT

(3) NHRS

(4) MISRPT

(5) MNUMS

The third and fourth cards contain run descriptive information as desired by the user.

The fifth and subsequent cards are arranged as shown above.

5 SAMPLE PROBLEM

A sample run is included to acquaint the user with the input deck arrangement and the output listing. The case considered is an aircraft with a lifetime of twelve hours that is comprised of six flights. There are two missions and the mission time and the mission selection is random. A temperature profile is included in mission 1 and both missions contain touch-and-go landings. The input data and the output listing are given below.

```
         1    1    1   13    0   11   17   12    3 1973    1    2    1    0 FIRST
         2    6   12    0    0                                              SECOND
              TEST CASE FOR FLIGHT-BY-FLIGHT SPECTRUM OF LOADS AND TEMP.    THIRD
              STRESS IN PSI      TEMP, IN DEGREES F                         FOURTH
      101  103    1                                                    CI SR      1
  -13000.0  -12000.0                                                      SR      2
         1   59.0                                                         TL
  1240012401      1                                                    CI NS      1
         3    2                                                           NS      2
  1241512416      1                                                    CI NTG     1
         1    2                                                           NTG     2
  1243012431      1                                                    CI NTEMP   1
         2    1                                                           NTEMP   2
  1244512446      1                                                    CI NTTF    1
         5    4                                                           NTTF    2
  1242012421      1                                                    CI NLTF    1
         3    5                                                           NLTF    2
  1329513296      1                                                    CI HUMML   1
         2    4                                                           HUMML   2
  1181511816      1                                                    CI MTTP    1
         2    3                                                           MTTP    2
  1183011831      1                                                    CI MTTN    1
         2    4                                                           MTTN    2
  1220512206      1                                                    CI MLT     1
         1    2                                                           MLT     2
  1222012221      1                                                    CI MLTP    1
         3    2                                                           MLT.    2
  1223512236      1                                                    CI MLTN    1
         3    2                                                           MLTN    2
  1237012371      1                                                    CI MTGI    1
         1    2                                                           MTGI    2
  1236512366      1                                                    CI MTGG    1
         1    2                                                           MTGG    2
         2                                                             CI STTP    1
       115    1    1    2    1   12   20                               CI STTP    2
   -5000.0   -6000.0                                                      STTP    3
       115    1    2    3    1   12   20                               CI STTP    4
   -6000.0   -7000.0   -8000.0                                            STTP    5
         2                                                             CI STTN    1
       415    1    1    2    1   12   20                                  STTN    2
   -6000.0   -8000.0                                                      STTN    3
       415    1    2    4    1   12   20                               CI STTN    4
   -7000.0   -9000.0  -11000.0  -12000.0                                  STTN    5
         5                                                             CI SFP     1
       715    1    1    2   12   10   20                               CI SFP     2
   25000.0   27000.0                                                      SFP     3
       715    1    2    2   12   10   20                               CI SFP     4
   26000.0   28000.0                                                      SFP     5
       715    1    3    3   12   10   20                               CI SFP     6
   26500.0   29000.0   31000.0                                            SFP     7
       715    2    1    2   12   10   20                               CI SFP     8
   29000.0   32000.0                                                      SFP     9
       715    2    2    4   12   10   20                               CI SFP    10
   24000.0   26000.0   26500.0   30000.0                                  SFP    11
         5                                                             CI SFN     1
      3115    1    1    3   12   10   20                               CI SFN     2
    6300.0    7600.0    8000.0                                            SFN     3
      3115    1    2    2   12   10   20                               CI SFN     4
    6500.0    7500.0                                                      SFN     5
      3115    1    3    2   12   10   20                               CI SFN     6
```

```
5000.0    6400.0                                                          BFN     7
  3115    2    1    2   12   10    20                                  CI BFN     8
4000.0    6200.0                                                          BFN     9
  3115    2    2    2   12   10    20                                  CI BFN    10
4400.0    4800.0                                                          BFN    11
     5                                                                 CI BFG     1
  5515    1    1    2   12   10    20                                  CI BFG     2
7400.0    7900.0                                                          BFG     3
  5515    1    2    3   12   10    20                                  CI BFG     4
10000.0   11000.0   12000.0                                               BFG     5
  5515    1    3    2   12   10    20                                  CI BFG     6
6700.0    7000.0                                                          BFG     7
  5515    2    1    1   12   10    20                                  CI BFG     8
10200.0                                                                   BFG     9
  5515    2    2    3   12   10    20                                  CI BFG    10
9000.0    9400.0    9800.0                                                BFG    11
     1                                                                 CI TF      1
  8815    1    1    2   12   10    20                                  CI TF      2
250.0     270.0                                                           TF      3
  9815    1    2    1   12   10    20                                  CI TF      4
260.0                                                                     TF      5
  8815    1    1    3   12   10    20                                  CI TF      6
255.0     255.0     275.0                                                 TF      7
     2                                                                 CI SLI     1
  7915    1    1    1    1   12    20                                  CI SLI     2
-15000.0                                                                  SLI     3
  7915    1    2    2    1   12    20                                  CI SLI     4
-17000.0  -19000.0                                                        SLI     5
     2                                                                 CI SLTP    1
  8215    1    1    3    1   12    20                                  CI SLTP    2
-8100.0   -8400.0   -8700.0                                               SLTP    3
  8215    1    2    2    1   12    20                                  CI SLTP    4
-7100.0   -7400.0   -7700.0                                               SLTP    5
     2                                                                 CI SLTN    1
  8515    1    1    3    1   12    20                                  CI SLTN    2
-11200    -11600.0  -11800.0                                              SLTN    3
  8515    1    2    3    1   12    20                                  CI SLTN    4
-10200.0  -10600.0  -10800.0                                              SLTN    5
     2                                                                 CI STGI    1
 11215    1    1    1    1   12    20                                  CI STGI    2
-17500.0                                                                  STGI    3
 11215    1    2    2    1   12    20                                  CI STGI    4
-18500.0  -19500.0                                                        STGI    5
     2                                                                 CI STGG    1
 11515    1    1    1    1   12    20                                  CI STGG    2
6600.0                                                                    STGG    3
 11515    1    2    2    1   12    20                                  CI STGG    4
6700.0    6800.0                                                          STGG    5
     4                                                                 CI NFF     1
 12400    1    1    3    3   12    10                                  CI NFF     2
     3    5    5                                                          NFF     3
 12400    1    2    2    3   12    10                                  CI NFF     4
     3    3                                                               NFF     5
 12400    2    1    3    3   12    10                                  CI NFF     6
     5    7    7                                                          NFF     7
 12400    2    2    2    3   12    10                                  CI NFF     8
     0    5                                                               NFF     9
     4                                                                 CI NFRAC   1
 12935    1    1    3    3   12    10                                  CI NFRAC   2
     1    1    1                                                          NFRAC   3
```

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12935     1     2     2     3    12    10                                CI NFRAC     4
    8     2                                                                 NFRAC     5
12935     2     1     3     3    12    10                                CI NFRAC     6
    1     1     1                                                           NFRAC     7
12935     2     2     2     3    12    10                                CI NFRAC     8
    0     2                                                                 NFRAC     9
    2                                                                  CI NITP      1
  115     1     1     2     1    12    20                                CI NITP      2
    8     2                                                                 NITP      3
  115     1     2     3     1    12    20                                CI NITP      4
    4     8     4                                                           NITP      5
    2                                                                  CI NITN      1
  415     1     1     2     1    12    20                                CI NITN      2
    7     3                                                                 NITN      3
  415     1     2     4     1    12    20                                CI NITN      4
    2     2     4     8                                                     NITN      5
    5                                                                  CI NFP       1
  715     1     1     2    12    10    20                                CI NFP       2
    4     4                                                                 NFP       3
  715     1     2     2    12    10    20                                CI NFP       4
    4     8                                                                 NFP       5
  715     1     3     3    12    10    20                                CI NFP       6
    3     3     6                                                           NFP       7
  715     2     1     2    12    10    20                                CI NFP       8
    8     4                                                                 NFP       9
  715     2     2     4    12    10    20                                CI NFP      10
    4     4     2     6                                                     NFP      11
    5                                                                  CI NFN       1
 3115     1     1     3    12    10    20                                CI NFN       2
    2     2     1                                                           NFN       3
 3115     1     2     2    12    10    20                                CI NFN       4
    2     2                                                                 NFN       5
 3115     1     3     2    12    10    20                                CI NFN       6
    1     2                                                                 NFN       7
 3115     2     1     2    12    10    20                                CI NFN       8
    2     4                                                                 NFN       9
 3115     2     2     2    12    10    20                                CI NFN      10
    4     4                                                                 NFN      11
    5                                                                  CI NFG       1
 5515     1     1     2    12    10    20                                CI NFG       2
    1     2                                                                 NFG       3
 5515     1     2     3    12    10    20                                CI NFG       4
    3     2     3                                                           NFG       5
 5515     1     3     2    12    10    20                                CI NFG       6
    7     2                                                                 NFG       7
 5515     2     1     1    12    10    20                                CI NFG       8
    6                                                                       NFG       9
 5515     2     2     3    12    10    20                                CI NFG      10
    2     2     4                                                           NFG      11
    2                                                                  CI NLI       1
 7915     1     1     1     1    12    20                                CI NLI       2
    2                                                                       NLI       3
 7915     1     2     2     1    12    20                                CI NLI       4
    3     1                                                                 NLI       5
    2                                                                  CI NLTP      1
 8215     1     1     3     1    12    20                                CI NLTP      2
    1     3     2                                                           NLTP      3
 8215     1     2     2     1    12    20                                CI NLTP      4
   10    10                                                                 NLTP      5
    2                                                                  CI NLTN      1
```

0515	1	1	1	1	12	20	CI	NLTN	2
3	2	1						NLTN	3
0515	1	2	2	1	12	20	CI	NLTN	4
15	5							NLTN	5
3							CI	NF	1
0015	1	1	2	12	10	20	CI	NF	2
9	7							NF	3
0015	1	2	1	12	10	20	CI	NF	4
24								NF	5
0015	1	3	3	12	10	20	CI	NF	6
10	7	7						NF	7
2							CI	NTGI	1
11215	1	1	1	1	12	20	CI	NTGI	2
2								NTGI	3
11215	1	2	2	1	12	20	CI	NTGI	4
4	4							NTGI	5
2							CI	NTGG	1
11515	1	1	1	1	12	20	CI	NTGG	2
2								NTGG	3
11515	1	2	2	1	12	20	CI	NTGG	4
4	4							NTGG	5
2							CI	MFP	1
11045	1	1	3	1	12	10	CI	MFP	2
2	2	3						MFP	3
11045	1	2	2	1	12	10	CI	MFP	4
2	4							MFP	5
2							CI	MFN	1
11905	1	1	3	1	12	10	CI	MFN	2
3	2	2						MFN	3
11905	1	2	2	1	12	10	CI	MFN	4
2	2							MFN	5
2							CI	MFG	1
12005	1	1	3	1	12	10	CI	MFG	2
2	3	2						MFG	3
12005	1	2	2	1	12	10	CI	MFG	4
1	3							MFG	5
1							CI	MF	1
12250	1	1	3	1	12	10	CI	MF	2
2	1	3						MF	3

```
RUN NO      1                DATE  12/ 3/1973              PAGE NO      1
TEST CASE FOR FLIGHT-BY-FLIGHT SPECTRUM OF LOADS AND TEMP.
STRESS IN PSI      TEMP. IN DEGREES F

STRESS SPECTRA DERIVED FROM FLT RECORDER DATA

SPECTRUM BASED ON      6  FLIGHTS AND    12  HOURS IN ONE LIFETIME

MISSION SELECTION IS RANDOM
MISSION NO  REPEATS/LIFE                      MISSION NO  REPEATS/LIFE
        1           2                                 2            4

MISSION TIME IS RANDOM
NUMBER OF MISSION TYPE INTERVALS =    2
MISSION TIME DISTRIBUTION ON NEXT PAGE
```

```
RUN NO     1           DATE  12/ 3/1973          PAGE NO     2

MISSION NUMBER     1  MISSION INTERVAL NO     1
INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE
          1               1               2               1               3               0

MISSION NUMBER     1  MISSION INTERVAL NO     2
INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE
          1               1               2               1               3               0

MISSION NUMBER     1  MISSION INTERVAL NO     3
INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE
          1               1               2               1               3               0

MISSION NUMBER     2  MISSION INTERVAL NO     1
INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE
          1               0               2               0               3               0

MISSION NUMBER     2  MISSION INTERVAL NO     2
INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE     INTERVAL NO     NUMBER/LIFE
          1               2               2               2               3               0
```

```
RUN NO      1          DATE  12/ 3/1973          PAGE NO      3

MISSION NUMBER    1

TAKE-OFF TAXI MAXIMUMS PER FLIGHT =    5

NUMBER OF INTERVALS IN MISSION =    3

MISSION INTERVAL NO    1
INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT
          1              3              2              5              3              0

MISSION INTERVAL NO    2
INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT
          1              5              2              7              3              0

MISSION INTERVAL NO    3
INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT
          1              5              2              7              3              0

LANDING TAXI MAXIMUMS PER FLIGHT =    3

NUMBER OF TOUCH-AND-GO LANDINGS PER FLIGHT =    1

TEMPERATURE PROFILE INCLUDED

STRESS AT REST IN TAKE-OFF CONFIGURATION =    -10000.

TAKE-OFF TAXI MAXIMUM LOAD SPECTRUM

      STRESS
 -5000.      -4000.
      NUMBER OF OCCURRENCES AT EACH STRESS
      6           2

TAKE-OFF TAXI MINIMUM LOAD SPECTRUM

      STRESS
 -9000.      -8000.
      NUMBER OF OCCURRENCES AT EACH STRESS
      7           3
```

```
RUN NO      1                DATE  12/ 3/1973            PAGE NO      4
     MISSION NUMBER      1

     FLIGHT MAXIMUM LOAD SPECTRUM
     INTERVAL NUMBER      1

     STRESS
25000.      27000.
     NUMBER OF OCCURRENCES AT EACH STRESS
     4          8

     FLIGHT MINIMUM LOAD SPECTRUM
     INTERVAL NUMBER      1

     STRESS
6000.       7000.       8000.
     NUMBER OF OCCURRENCES AT EACH STRESS
     2          2          1

     FLIGHT ONE G LOAD SPECTRUM
     INTERVAL NUMBER      1

     STRESS
7400.       7900.
     NUMBER OF OCCURRENCES AT EACH STRESS
     1          2

     FLIGHT TEMPERATURE SPECTRUM
     INTERVAL NUMBER      1

     TEMPERATURE
250.        270.
     NUMBER OF OCCURRENCES AT EACH TEMPERATURE
     0          7
```

```
            RUN NO     1          DATE  12/ 3/1973          PAGE NO     5

            MISSION NUMBER     1

            FLIGHT MAXIMUM LOAD SPECTRUM
            INTERVAL NUMBER     2

            STRESS
       26000.       28000.
            NUMBER OF OCCURRENCES AT EACH STRESS
            4           8

            FLIGHT MINIMUM LOAD SPECTRUM
            INTERVAL NUMBER     2

            STRESS
        6500.       7500.
            NUMBER OF OCCURRENCES AT EACH STRESS
            2           2

            FLIGHT ONE G LOAD SPECTRUM
            INTERVAL NUMBER     2

            STRESS
       10000.       11000.      12000.
            NUMBER OF OCCURRENCES AT EACH STRESS
            3           2           3

            FLIGHT TEMPERATURE SPECTRUM
            INTERVAL NUMBER     2

            TEMPERATURE
         200.
            NUMBER OF OCCURRENCES AT EACH TEMPERATURE
           24
```

```
RUN NO      1            DATE  12/ 3/1975          PAGE NO     6
MISSION NUMBER     1

FLIGHT MAXIMUM LOAD SPECTRUM
INTERVAL NUMBER     3

STRESS
26500.      29000.      31000.
NUMBER OF OCCURRENCES AT EACH STRESS
3           3           6

FLIGHT MINIMUM LOAD SPECTRUM
INTERVAL NUMBER     3

STRESS
5000.       6400.
NUMBER OF OCCURRENCES AT EACH STRESS
1           2

FLIGHT ONE G LOAD SPECTRUM
INTERVAL NUMBER     3

STRESS
6700.       7000.
NUMBER OF OCCURRENCES AT EACH STRESS
7           2

FLIGHT TEMPERATURE SPECTRUM
INTERVAL NUMBER     3

TEMPERATURE
255.        265.        275.
NUMBER OF OCCURRENCES AT EACH TEMPERATURE
10          7           7
```

```
RUN NO     1          DATE  12/ 3/1973          PAGE NO     7

MISSION NUMBER     1

TOUCH-AND-GO LANDING IMPACT LOAD SPECTRUM

STRESS
-17500.
NUMBER OF OCCURRENCES AT EACH STRESS
2

TOUCH-AND-GO LANDING ONE G SPECTRUM

STRESS
6000.
NUMBER OF OCCURRENCES AT EACH STRESS
2

LANDING IMPACT LOAD SPECTRUM

STRESS
-15000.
NUMBER OF OCCURRENCES AT EACH STRESS
2

LANDING TAXI MAXIMUM LOAD SPECTRUM

STRESS
-6100.      -6400.      -6700.
NUMBER OF OCCURRENCES AT EACH STRESS
1           3           2

LANDING TAXI MINIMUM LOAD SPECTRUM

STRESS
-12000.     -11600.     -11800.
NUMBER OF OCCURRENCES AT EACH STRESS
3           2           1

GROUND CONDITION TEMPERATURE =      59.
```

```
RUN NO     1          DATE  12/ 3/1973          PAGE NO    8
MISSION NUMBER     2
TAKE-OFF TAXI MAXIMUMS PER FLIGHT =     6
NUMBER OF INTERVALS IN MISSION =     2
MISSION INTERVAL NO     1
INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT
      1             3               2             0               3             0
MISSION INTERVAL NO     2
INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT    INTERVAL NO  FLT LOADS/FLT
      1             3               2             5               3             0
LANDING TAXI MAXIMUMS PER FLIGHT =     5
NUMBER OF TOUCH-AND-GO LANDINGS PER FLIGHT =     2
TEMPERATURE PROFILE NOT INCLUDED
STRESS AT REST IN TAKE-OFF CONFIGURATION =     -12000.
TAKE-OFF TAXI MAXIMUM LOAD SPECTRUM
STRESS
-6000.      -7000.      -8000.
NUMBER OF OCCURRENCES AT EACH STRESS
      4           8           4
TAKE-OFF TAXI MINIMUM LOAD SPECTRUM
STRESS
-7000.      -9000.      -11000.     -12000.
NUMBER OF OCCURRENCES AT EACH STRESS
      2           2           4           8
```

```
RUN NO      1          DATE  12/ 3/1973          PAGE NO     9

        MISSION NUMBER    2

        FLIGHT MAXIMUM LOAD SPECTRUM
        INTERVAL NUMBER     1

        STRESS
   28000.     32000.
        NUMBER OF OCCURRENCES AT EACH STRESS
        8          8

        FLIGHT MINIMUM LOAD SPECTRUM
        INTERVAL NUMBER     1

        STRESS
    4000.      6200.
        NUMBER OF OCCURRENCES AT EACH STRESS
        2          4

        FLIGHT ONE G LOAD SPECTRUM
        INTERVAL NUMBER     1

        STRESS
   18200.
        NUMBER OF OCCURRENCES AT EACH STRESS
        8
```

```
RUN NO      1            DATE  12/ 3/1973            PAGE NO    10

MISSION NUMBER      2

FLIGHT MAXIMUM LOAD SPECTRUM
INTERVAL NUMBER      2

STRESS
24000.      24000.      26500.      30000.
NUMBER OF OCCURRENCES AT EACH STRESS
4           4           2           6

FLIGHT MINIMUM LOAD SPECTRUM
INTERVAL NUMBER      2

STRESS
4400.       4800.
NUMBER OF OCCURRENCES AT EACH STRESS
4           4

FLIGHT ONE G LOAD SPECTRUM
INTERVAL NUMBER      2

STRESS
9000.       9400.       9800.
NUMBER OF OCCURRENCES AT EACH STRESS
2           2           4
```

```
RUN NO     1          DATE  12/ 3/1975          PAGE NO    11

           MISSION NUMBER     2

           TOUCH-AND-GO LANDING IMPACT LOAD SPECTRUM

           STRESS
   -18500.     -19500.
           NUMBER OF OCCURRENCES AT EACH STRESS
           4           4

           TOUCH-AND-GO LANDING ONE G SPECTRUM

           STRESS
     6700.       6800.
           NUMBER OF OCCURRENCES AT EACH STRESS
           4           4

           LANDING IMPACT LOAD SPECTRUM

           STRESS
   -17000.     -19000.
           NUMBER OF OCCURRENCES AT EACH STRESS
           3           1

           LANDING TAXI MAXIMUM LOAD SPECTRUM

           STRESS
    -7100.      -7400.
           NUMBER OF OCCURRENCES AT EACH STRESS
          10          10

           LANDING TAXI MINIMUM LOAD SPECTRUM

           STRESS
   -10200.     -10600.
           NUMBER OF OCCURRENCES AT EACH STRESS
          15           5

           GROUND CONDITION TEMPERATURE =       59.
```

RUN NO 1 DATE 12/ 3/1973 PAGE NO 12

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 1
MISSION NUMBER = 1
NUMBER OF LOADS = 58

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-10000.	59.	2	-5000.	59.	3	-8000.	59.
4	-5000.	59.	5	-8000.	59.	6	-4000.	59.
7	-6000.	59.	8	-5000.	59.	9	-8000.	59.
10	-5000.	59.	11	-6000.	59.	12	25000.	270.
13	7000.	250.	14	25000.	270.	15	7900.	250.
16	25000.	270.	17	8000.	250.	18	27000.	270.
19	7900.	250.	20	27000.	250.	21	6000.	270.
22	28000.	260.	23	12000.	260.	24	28000.	260.
25	11000.	260.	26	26000.	260.	27	10000.	260.
28	28000.	260.	29	6500.	260.	30	28000.	260.
31	11000.	260.	32	28000.	260.	33	10000.	260.
34	28000.	260.	35	12000.	260.	36	31000.	275.
37	6700.	255.	38	26500.	265.	39	6400.	275.
40	29000.	275.	41	6700.	265.	42	31000.	265.
43	6700.	275.	44	26500.	275.	45	6700.	255.
46	31000.	255.	47	6700.	265.	48	31000.	255.
49	6700.	275.	50	-17500.	59.	51	6600.	59.
52	-15000.	59.	53	-6400.	59.	54	-11600.	59.
55	-6100.	59.	56	-11600.	59.	57	-6400.	59.
58	-112000.	59.	59	0.	0.	60	0.	0.

RUN NO 1 DATE 12/ 3/1973 PAGE NO 13

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 2
MISSION NUMBER = 2
NUMBER OF LOADS = 49

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	2	-8000.	59.	3	-12000.	59.
4	-7000.	59.	5	-12000.	59.	6	-6000.	59.
7	-7000.	59.	8	-7000.	59.	9	-12000.	59.
10	29000.	59.	11	6200.	59.	12	29000.	59.
13	10200.	59.	14	32000.	59.	15	10200.	59.
16	24000.	59.	17	9800.	59.	18	26000.	59.
19	4800.	59.	20	30000.	59.	21	4800.	59.
22	26000.	59.	23	4400.	59.	24	24000.	59.
25	9000.	59.	26	-19500.	59.	27	6700.	59.
28	-18500.	59.	29	6700.	59.	30	-17000.	59.
31	-7100.	59.	32	-10600.	59.	33	-7100.	59.
34	-10200.	59.	35	-7400.	59.	36	-10200.	59.
37	-7100.	59.	38	-10200.	59.	39	-7100.	59.
40	-10600.	59.	41	6700.	265.	42	31000.	265.

RUN NO 1 DATE 12/ 3/1973 PAGE NO 14

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 3
MISSION NUMBER = 1
NUMBER OF LOADS = 48

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-10000.	59.	2	-5000.	59.	3	-6000.	59.
4	-5000.	59.	5	-6000.	59.	6	-5000.	59.
7	-6000.	59.	8	-8000.	59.	9	-6000.	59.
10	-5000.	59.	11	-6000.	59.	12	27000.	250.
13	6000.	250.	14	25000.	270.	15	7000.	250.
16	27000.	270.	17	7400.	250.	18	26000.	260.
19	12000.	260.	20	28000.	260.	21	6500.	260.
22	26000.	260.	23	7500.	260.	24	26000.	260.
25	7500.	260.	26	28000.	260.	27	10000.	260.
28	29000.	275.	29	7600.	255.	30	29000.	255.
31	5000.	255.	32	31000.	265.	33	7600.	255.
34	26500.	265.	35	6400.	265.	36	31000.	255.
37	6700.	255.	38	-17500.	59.	39	6600.	59.
40	-15000.	59.	41	-6700.	59.	42	-11800.	59.
43	-6400.	59.	44	-112000.	59.	45	-6700.	59.
46	-112000.	59.	47	6700.	265.	48	31000.	255.

RUN NO 1 DATE 12/ 3/1973 PAGE NO 15

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 4
MISSION NUMBER = 2
NUMBER OF LOADS = 36

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	2	-7000.	59.	3	-12000.	59.
4	-7000.	59.	5	-12000.	59.	6	-8000.	59.
7	-11000.	59.	8	-6000.	59.	9	-12000.	59.
10	32000.	59.	11	6200.	59.	12	29000.	59.
13	10200.	59.	14	29000.	59.	15	6200.	59.
16	26000.	59.	17	4800.	59.	18	24000.	59.
19	9600.	59.	20	28500.	59.	21	9800.	59.
22	-19500.	59.	23	6800.	59.	24	-18500.	59.
25	6700.	59.	26	-17000.	59.	27	-7400.	59.
28	-10600.	59.	29	-7400.	59.	30	-10600.	59.
31	-7400.	59.	32	-10200.	59.	33	-7100.	59.
34	-10200.	59.	35	-7400.	59.	36	-10200.	59.

RUN NO 1 DATE 12/ 3/1975 PAGE NO 1

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 5
MISSION NUMBER = 2
NUMBER OF LOADS = 36

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	2	-7000.	59.	3	-12000.	59.
4	-6000.	59.	5	-7000.	59.	6	-7000.	59.
7	-12000.	59.	8	-8000.	59.	9	-9000.	59.
10	29000.	59.	11	4000.	59.	12	32000.	59.
13	10200.	59.	14	29000.	59.	15	10200.	59.
16	30000.	59.	17	9800.	59.	18	26000.	59.
19	4800.	59.	20	28500.	59.	21	9400.	59.
22	-19500.	59.	23	6800.	59.	24	-18500.	59.
25	6800.	59.	26	-19000.	59.	27	-7100.	59.
28	-10200.	59.	29	-7400.	59.	30	-10209.	59.
31	-7100.	59.	32	-10200.	59.	33	-7400.	59.
34	-10200.	59.	35	-7100.	59.	36	-10600.	59.

RUN NO 1 DATE 12/ 3/1973 PAGE NO 17

FLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE
FLIGHT NUMBER = 4
MISSION NUMBER = 2
NUMBER OF LOADS = 40

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	2	-7000.	59.	3	-9000.	59.
4	-7000.	59.	5	-11000.	59.	6	-6000.	59.
7	-11000.	59.	8	-8000.	59.	9	-11000.	59.
10	29000.	59.	11	10200.	59.	12	29000.	59.
13	4900.	59.	14	32000.	59.	15	6200.	59.
16	30000.	59.	17	8400.	59.	18	30000.	59.
19	9000.	59.	20	24000.	59.	21	9400.	59.
22	30000.	59.	23	4400.	59.	24	30000.	59.
25	8400.	59.	26	-19500.	59.	27	6600.	59.
28	-18500.	59.	29	6700.	59.	30	-17000.	59.
31	-7400.	59.	32	-10200.	59.	33	-7100.	59.
34	-10200.	59.	35	-7400.	59.	36	-10200.	59.
37	-7400.	59.	38	-10200.	59.	39	-7100.	59.
40	-10200.	59.	41	-6700.	59.	42	-11800.	59.

As noted in the introduction, the spectrum printout as given by this routine may not be useful for subsequent use in fatigue or fracture mechanics calculation. It should not be difficult, however, to modify this program to form the desired linkage through magnetic tape or other device.

IV REFERENCES

1. Lincoln, John W., ASD-TR-80-5037, Development of an Aircraft Maneuver Load Spectrum Based on VGH Data, July 1980.

APPENDIX - SPECF PROGRAM LISTING

This listing given below is a FORTRAN extended language routine. The DIMENSION statements are set up for an aircraft flying twelve missions with ten mission intervals each. The EQUIVALENCE statements are compatible with a spectrum for fifteen missions with eight mission intervals in each mission. Consequently, this case may be analyzed with a simple DIMENSION statement change.

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PROGRAM SPECF      74/74   OPT=1                        FTN 4.6+P355      02/01/74  17.37.15.      PAGE    1

                 PROGRAM SPECF (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
C                  PROGRAM FOR COMPUTING FLIGHT-BY-FLIGHT LOADING SEQUENCE      MAIN  1
C                  FOR A FATIGUE TEST                                           MAIN  2
                        COMMON P(13000), N(13500)                               MAIN  3
                        EQUIVALENCE (N(48), NZERO)                              MAIN  4
                        NZERO = 0                                               MAIN  5
           10           CALL GUIDE                                              MAIN  6
                        GO TO 10                                                MAIN  7
                        END                                                     MAIN  8
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```
                SUBROUTINE GUIDE                                      GIDE   1
C     SUBROUTINE FOR CALLING INPUT DATA AND CALCULATION ROUTINES      GIDE   2
      COMMON P(13000), N(13500)                                       GIDE   3
      EQUIVALENCE (N(40), NZERO)                                      GIDE   4
      IF (NZERO) 40, 10                                               GIDE   5
   10 DO   20 I = 1, 13000                                            GIDE   6
   20 P(I) = 0.0                                                      GIDE   7
      DO   30 I = 1, 13500                                            GIDE   8
   30 N(I) = 0                                                        GIDE   9
      GO TO 60                                                        GIDE  10
   40 DO   50 I = 11815, 13000                                        GIDE  11
   50 P(I) = 0.0                                                      GIDE  12
   60 CALL INPUT                                                      GIDE  13
      CALL COMP                                                       GIDE 131
      CALL CALC                                                       GIDE  14
      RETURN                                                          GIDE  15
      END                                                             GIDE  16
```

```
      SUBROUTINE INPUT                                                DEIN   1
C     SUBROUTINE FOR INPUT OF FLOATING AND FIXED POINT NUMBERS        DEIN   2
      COMMON P(13000), N(13500)                                       DEIN   3
      INTEGER DAY, YEAR                                               DEIN   4
      EQUIVALENCE (N(1), IDENT), (N(2), NPF1),                        DEIN  42
     1 (N(3), NPF2), (N(4), NPF3), (N(5), NPF4),                      DEIN  44
     2 (N(6), NPF5), (N(7), NPF6),                                    DEIN  45
     3 (N(8), MONTH), (N(9), DAY), (N(10), YEAR)                      DEIN  46
      EQUIVALENCE (N(11), NCASE), (N(12), NM),                        DEIN  47
     1 (N(13), NRANM),          (N(15), NMTMS), (N(16), NFLT),        DEIN  48
     2 (N(17), NHRS), (N(18), MISRPT), (N(19), MNUMS)                 DEIN  49
      EQUIVALENCE (N(49), NPAGE)                                      DEIN   5
C     INPUT DATA - CONTROL INTEGERS                                   DEIN   6
C     N(1) = IDENT - PROBLEM NUMBER                                   DEIN   7
C     N(2) = NPF1 - NUMBER OF SETS OF PARAMETERS TO BE READ           DEIN   8
C                 BY FORMAT 1                                         DEIN   9
C     N(3) = NPF2 - NUMBER OF PARAMETERS TO BE READ BY FORMAT 2       DEIN  10
C     N(4) = NPF3 - NUMBER OF SETS OF INTEGERS TO BE READ BY          DEIN  11
C                 FORMAT 3                                            DEIN  12
C     N(5) = NPF4 - NUMBER OF INTEGERS TO BE READ BY FORMAT 4         DEIN  13
C     N(6) = NPF5 - NUMBER OF PARAMETER ARRAYS TO BE READ BY          DEIN 131
C                 FORMAT 5                                            DEIN 132
C     N(7) = NPF6 - NUMBER OF INTEGER ARRAYS TO BE READ BY            DEIN 133
C                 FORMAT 6                                            DEIN 134
C     N(8) = MONTH                                                    DEIN  14
C     N(9) = DAY                                                      DEIN  15
C     N(10) = YEAR                                                    DEIN  16
C     N(11) = NCASE = 1 IF STRESS SPECTRA FROM RECORDED DATA          DEIN  17
C                   = 2 IF STRESS SPECTRA FROM MISSION PROFILES       DEIN  18
C     N(12) = NM - NUMBER OF MISSIONS                                 DEIN  19
C     N(13) = NRANM = 1 IF MISSIONS ARE RANDOMLY SELECTED             DEIN  20
C                     2 IF MISSION SELECTION IS NONRANDOM             DEIN  21
C     N(15) = NMTMS - NUMBER OF MISSION TIME STEPS (CASE 1)           DEIN  23
C     N(16) = NFLT - NUMBER OF FLIGHTS IN ONE LIFETIME                DEIN  24
C     N(17) = NHRS - NUMBER OF FLIGHT HOURS IN ONE LIFETIME           DEIN  25
C     N(18) = MISRPT - NUMBER OF TIMES A NONRANDOM MISSION            DEIN  26
C             SEQUENCE IS REPEATED IN ONE LIFETIME                    DEIN  27
C     N(19) = MNUMS - NUMBER OF DIFFERENT MISSION SELECTIONS IN A     DEIN  28
C             NONRANDOM SEQUENCE                                      DEIN  29
C     INPUT DATA - PARAMETERS - INPUT FORMAT                          DEIN  30
C     P(1) = TL                       2                               DEIN  31
C     P(101) = SR(1)                  1                               DEIN  32
C     P(115) = STTP(1,1)              5                               DEIN  33
C     P(415) = STTN(1,1)              5                               DEIN  34
C     P(715) = SFP(1,1,1)             5                               DEIN  35
C     P(3115) = SFN(1,1,1)            5                               DEIN  36
C     P(5515) = SFG(1,1,1)            5                               DEIN  37
C     P(7915) = SLT(1,1)              5                               DEIN  38
C     P(8215) = SLTP(1,1)             5                               DEIN  39
C     P(8515) = SLTN(1,1)             5                               DEIN  40
C     P(8815) = TF(1,1,1)             5                               DEIN  41
C     P(11215) = STOI(1,1)            5                               DEIN  42
C     P(11515) = STGG(1,1)            5                               DEIN  43
C     INPUT DATA - INTEGERS - INPUT FORMAT                            DEIN  44
C     N(115) = NTTP(1,1)              6                               DEIN  45
C     N(415) = NTTN(1,1)              6                               DEIN  46
C     N(715) = NFP(1,1,1)             6                               DEIN  47
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C         N(3115) = NFN(1,1,1)           6                        DEIN 48
C         N(5515) = NFG(1,1,1)           6                        DEIN 49
C         N(7915) = NLI(1,1)             6                        DEIN 50
C         N(8215) = NLTP(1,1)            6                        DEIN 51
C         N(8515) = NLTN(1,1)            6                        DEIN 52
C         N(8815) = NF(1,1,1)            6                        DEIN 53
C         N(11215) = NTGI(1,1)           6                        DEIN 54
C         N(11515) = NTGG(1,1)           6                        DEIN 55
C         N(11815) = NTTP(1)             3                        DEIN 56
C         N(11830) = NTTN(1)             3                        DEIN 57
C         N(11845) = NFP(1,1)            6                        DEIN 58
C         N(11905) = NFN(1,1)            6                        DEIN 59
C         N(12085) = NFG(1,1)            6                        DEIN 60
C         N(12205) = NLI(1)              3                        DEIN 61
C         N(12220) = NLTP(1)             3                        DEIN 62
C         N(12235) = NLTN(1)             3                        DEIN 63
C         N(12250) = NF(1,1)             6                        DEIN 64
C         N(12370) = NTGI(1)             3                        DEIN 65
C         N(12385) = NTGG(1)             3                        DEIN 66
C         N(12400) = NS(1)               3                        DEIN 67
C         N(12415) = NTG(1)              3                        DEIN 68
C         N(12430) = NTEMP(1)            3                        DEIN 69
C         N(12445) = NTIF(1)             3                        DEIN 70
C         N(12460) = NFP(1,1,1)          6                        DEIN 71
C         N(12820) = NLTF(1)             3                        DEIN 72
C         N(12835) = NNUM(1)             3                        DEIN 73
C         N(12865) = NUMRPT(1)           3                        DEIN 74
C         N(12935) = NFRAC(1,1,1)        6                        DEIN 75
C         N(13295) = NUMML(1)            3                        DEIN 76
C         SET PAGE NUMBER EQUAL TO ONE                            DEIN 78
                NPAGE = 1                                         DEIN 79
C         READ CONTROL INTEGERS                                   DEIN 80
                READ (5,10) (N(I), I = 1, 19)                     DEIN 81
     10   FORMAT (14I5)                                           DEIN 82
                CALL PAGEHD                                       DEIN 83
C         READ AND WRITE MISCELLANEOUS RUN INFORMATION            DEIN 84
                  READ (5,20)                                     DEIN 85
     20   FORMAT (36H                                             DEIN 86
         1 , 36H                                                  DEIN 87
         2 / 36H                                                  DEIN 88
         3 , 36H                                                 )DEIN 89
                  WRITE (6,20)                                    DEIN 90
C         READ IN PARAMETERS BY FORMAT 1                          DEIN 91
                  IF (NPF1) 30, 70                                DEIN 92
     30           DO  60 I = 1, NPF1                              DEIN 93
                  READ (5,40) NP11, NP22, NP33                    DEIN 94
     40   FORMAT (3I5)                                            DEIN 95
                  READ (5,50) (P(J), J = NP11, NP22, NP33)        DEIN 96
     50   FORMAT (6E10.3)                                         DEIN 97
     60           CONTINUE                                        DEIN 98
C         READ IN PARAMETERS BY FORMAT 2                          DEIN 99
     70           IF (NPF2) 80, 110                               DEIN100
     80           DO  100 J = 1, NPF2                             DEIN101
                  READ (5,90) I, P(I)                             DEIN102
     90   FORMAT (I5, E15.7)                                      DEIN103
    100           CONTINUE                                        DEIN104
C         READ IN INTEGERS BY FORMAT 3                            DEIN105
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      SUBROUTINE INPUT      74/74   OPT=1                    FTN 4.0+P353      02/01/74  17.37.22.       PAGE    5

  110               IF (NPF3) 120, 160                                            DEIN106
  120               DO  150 I = 1, NPF3                                           DEIN107
                    READ (5,130) NNG11, NNG22, NNG33                              DEIN108
  130      FORMAT (3I5)                                                           DEIN109
                    READ (5,140) (N(J), J = NNG11, NNG22, NNG33)                  DEIN110
  140      FORMAT (12I5)                                                          DEIN111
  150               CONTINUE                                                      DEIN112
C          READ IN INTEGERS BY FORMAT 4                                           DEIN113
  160               IF (NPF4) 170, 200                                            DEIN114
  170               DO  190 J = 1, NPF4                                           DEIN115
                    READ (5,180) I, N(I)                                          DEIN116
  180      FORMAT (I5, I15)                                                       DEIN117
  190               CONTINUE                                                      DEIN118
C          READ IN PARAMETERS BY FORMAT 5                                         DEIN119
  200               IF (NPF5) 210, 240                                            DEIN120
  210               DO  230 I = 1, NPF5                                           DEIN121
                    READ (5,220) N5SETS                                           DEIN122
                    DO  230 J = 1, N5SETS                                         DEIN123
                    READ (5,220) K, N1, N2, N3, L1, L2, L3                        DEIN124
  220      FORMAT (7I5)                                                           DEIN125
                    READ (5,50)  (P(K + N1 - 1 + L1 * (N2 - 1 +                   DEIN126
         1 L2 * (I3 - 1))), I3 = 1, N3)                                           DEIN127
  230               CONTINUE                                                      DEIN128
C          READ IN INTEGERS BY FORMAT 6                                           DEIN129
  240               IF (NPF6) 250, 270                                            DEIN130
  250               DO  260 I = 1, NPF6                                           DEIN131
                    READ (5,220) N6SETS                                           DEIN132
                    DO  260 J = 1, N6SETS                                         DEIN133
                    READ (5,220) K, N1, N2, N3, L1, L2, L3                        DEIN134
                    READ (5,140) (N(K + N1 - 1 + L1 * (N2 - 1 +                   DEIN135
         1 L2 * (I3 - 1))), I3 = 1, N3)                                           DEIN136
  260               CONTINUE                                                      DEIN137
  270               CALL INAID                                                    DEIN138
                    RETURN                                                        DEIN139
                    END                                                           DEIN140
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                SUBROUTINE INAID                                        INAD   1
      C         SUBROUTINE FOR WRITING THE INPUT DATA                   INAD   2
                COMMON P(13000), N(13500)                               INAD   3
                INTEGER DAY, YEAR                                       INAD   4
                DIMENSION SN(12), STTP(12,20), STTN(12,20),             INAD   5
              1 SFP(12,10,20), SFN(12,10,20), SFG(12,10,20), SLI(12,20),INAD   6
              2 SLTP(12,20), SLTN(12,20), TF(12,10,20), STGI(12,20),    INAD   7
              3 STGG(12,20)                                             INAD   8
                DIMENSION NTTP(12,20), NTTN(12,20), NFP(12,10,20),      INAD   9
              1 NFN(12,10,20), NFG(12,10,20), NLI(12,20), NLTP(12,20),  INAD  10
              2 NLTN(12,20), NF(12,10,20), NTGI(12,20), NTGG(12,20),    INAD  11
              3 MTTP(12), MTTN(12), MFP(12,10), MFN(12,10), MFG(12,10), INAD  12
              4 MLI(12), MLTP(12), MLTN(12), MF(12,10), MTGI(12), MTGG(12),INAD  13
              5 FS(12), FTG(12), NTEMP(12), NTTF(12), NFF(3,12,10), NLTF(12), INAD  14
              6 MNUM(50), NUMRPT(50), NFRAC(3,12,10), NUMML(12)         INAD  15
                EQUIVALENCE (P(1), TL)                                  INAD  16
                EQUIVALENCE (P(101), SR), (P(115), STTP),               INAD  17
              1 (P(415), STTN), (P(715), SFP), (P(3115), SFN), (P(5515), SFG), INAD  18
              2 (P(7915), SLI), (P(8215), SLTP), (P(8515), SLTN),       INAD  19
              3 (P(8815), TF), (P(11215), STGI), (P(11515), STGG)       INAD  20
                EQUIVALENCE (N(1), IDENT), (N(2), NPF1),                INAD  21
              1 (N(3), NPF2), (N(4), NPF3), (N(5), NPF4),               INAD  22
              2 (N(6), NPF5), (N(7), NPF6),                             INAD 221
              3 (N(8), MONTH), (N(9), DAY), (N(10), YEAR)               INAD  23
                EQUIVALENCE (N(11), NCASE), (N(12), NM),                INAD  24
              1 (N(13), NRANM),            (N(15), NMTMS), (N(16), NFLT), INAD  25
              2 (N(17), NMFS), (N(18), MISRPT), (N(19), MNUMS)          INAD  26
                EQUIVALENCE (N(48), NZEND), (N(49), NPAGE)              INAD  27
                EQUIVALENCE (N(115), NTTP), (N(415), NTTN),             INAD  28
              1 (N(715), NFP), (N(3115), NFN), (N(5515), NFG), (N(7915), NLI), INAD  29
              2 (N(8215), NLTP), (N(8515), NLTN), (N(8815), NF),        INAD  30
              3 (N(11215), NTGI), (N(11515), NTGG), (N(11815), MTTP),   INAD  31
              4 (N(11830), MTTN), (N(11845), MFP), (N(11965), MFN),     INAD  32
              5 (N(12085), MFG), (N(12205), MLI), (N(12220), MLTP),     INAD  33
              6 (N(12235), MLTN), (N(12250), MF), (N(12370), MTGI),     INAD  34
              7 (N(12385), MTGG), (N(12400), NS)                        INAD  35
                EQUIVALENCE (N(12415), NTG), (N(12430), NTEMP),         INAD  36
              1 (N(12445), NTTF), (N(12460), NFF), (N(12820), NLTF),    INAD  37
              2 (N(12835), MNUM), (N(12885), NUMRPT), (N(12935), NFRAC), INAD  38
              3 (N(13295), NUMML)                                       INAD  39
      C         SPECIFY ORIGIN OF MANEUVER STRESS SPECTRA, FLIGHTS, AND HOURS INAD  40
                GO TO (10,30), NCASE                                    INAD  41
         10     WRITE (6,20)                                            INAD  42
         20     FORMAT (/10X, 45HSTRESS SPECTRA DERIVED FROM FLT RECORDER DATA) INAD  43
                GO TO 50                                                INAD  44
         30     WRITE (6,40)                                            INAD  45
         40     FORMAT (/10X, 44HSTRESS SPECTRA DERIVED FROM MISSION PROFILES) INAD  46
         50     WRITE (6,60) NFLT, NMHS                                 INAD  47
         60     FORMAT (/10X, 17HSPECTRUM BASED ON, I5, 2X, 11HFLIGHTS AND, INAD  48
              1 I5, 2X, 21HHOURS IN ONE LIFETIME  )                     INAD  49
      C         SPECIFY IF MISSION SELECTION AND MISSION TIME IS RANDOM OR NOT INAD  50
                GO TO (70,110), NRANM                                   INAD  51
         70     WRITE (6,80)                                            INAD  52
         80     FORMAT (/10X, 27HMISSION SELECTION IS RANDOM            INAD  53
              1         /10X, 10HMISSION NO, 2X, 12HREPEATS/LIFE, 10X,  INAD  54
              2 10HMISSION NO, 2X, 12HREPEATS/LIFE )                    INAD 541
                DO  90 I = 1, NM, 2                                     INAD  55
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      90         WRITE (6,100) I, NUMML(I), I+1, NUMML(I+1)              INAD 56
     100   FORMAT (I20, I14, I20, I14 )                                 INAD 57
                 GO TO 150                                              INAD 58
     110         WRITE (6,120) MNUMS, MISRPT                            INAD 59
     120   FORMAT (/10X, 30HMISSION SELECTION IS NONRANDOM              INAD 60
          1        /10X, 44HNUMBER OF DIFFERENT MISSIONS IN A SEQUENCE =, INAD 61
          2  I5,   /10X, 46HNUMBER OF TIMES MISSION SEQUENCE IS REPEATED =INAD 62
          3  , I5)                                                      INAD 63
                 WRITE (6,130)                                          INAD 64
     130   FORMAT (/10X, 44HMISSION SEQUENCE ORDER AND NUMBER OF REPEATS) INAD 65
                 DO  135 I = 1, MNUMS, 4                                INAD 66
     135         WRITE (6,140) I, MNUM(I), NUMRPT(I), I+1, MNUM(I+1),   INAD 67
          1  NUMRPT(I+1), I+2, MNUM(I+2), NUMRPT(I+2), I+3, MNUM(I+3),  INAD 68
          2  NUMRPT(I+3)                                                INAD 69
     140   FORMAT (I15, 2I5, I15, 2I5, I15, 2I5, I15, 2I5)              INAD 70
     150         IF (NMTMS - 1) 160, 210                                INAD 71
     160         WRITE (6,170) NMTMS                                    INAD 72
     170   FORMAT (/10X, 22HMISSION TIME IS RANDOM                      INAD 73
          1        /10X, 34HNUMBER OF MISSION TIME INTERVALS =, I5      INAD 74
          2        /10X, 38HMISSION TIME DISTRIBUTION ON NEXT PAGE)     INAD 75
                 NPAGE = NPAGE + 1                                      INAD 76
                 CALL PAGEHD                                            INAD 77
                 DO  190 I = 1, NM                                      INAD 82
                 NSI = NS(I)                                            INAD 83
                 DO  190 J = 1, NSI                                     INAD 831
                 WRITE (6,180) I,J                                      INAD 832
     180   FORMAT (/10X, 14HMISSION NUMBER, I5, 2X,                     INAD 833
          1  19HMISSION INTERVAL NO, I5)                                INAD 834
                 WRITE (6,185)                                          INAD 835
     185   FORMAT ( 10X, 11HINTERVAL NO, 4X, 11HNUMBER/LIFE, 4X,        INAD 836
          1  11HINTERVAL NO, 4X, 11HNUMBER/LIFE, 4X, 11HINTERVAL NO,    INAD 837
          2  4X, 11HNUMBER/LIFE )                                       INAD 838
                 DO  190 K = 1, NMTMS, 3                                INAD 84
                 KP2 = K + 2                                            INAD 842
                 KP1 = K + 1                                            INAD 841
     190         WRITE (6,200) K, NFRAC(K,I,J), KP1, NFRAC(KP1,I,J),    INAD 843
          1  KP2, NFRAC(KP2,I,J)                                        INAD 844
     200   FORMAT (I21, 5I15)                                           INAD 845
                 GO TO 225                                              INAD 88
     210         WRITE (6,220)                                          INAD 89
     220   FORMAT (10X, 25HMISSION TIME IS NONRANDOM)                   INAD 90
C          WRITE OUT MISSION LOAD AND TEMPERATURE OCCURRENCES           INAD 91
     225         DO  590 I = 1, NM                                      INAD 92
                 NPAGE = NPAGE + 1                                      INAD 93
                 CALL PAGEHD                                            INAD 94
C          WRITE MISSION BASIC DATA                                     INAD 95
                 WRITE (6,230) I                                        INAD 96
     230   FORMAT (/10X, 14HMISSION NUMBER, I5)                         INAD 97
                 WRITE (6,240) NTTF(I)                                  INAD 98
     240   FORMAT (/10X, 35HTAKE-OFF TAXI MAXIMUMS PER FLIGHT =, I5)    INAD 99
                 WRITE (6,250) NS(I)                                    INAD100
     250   FORMAT (/10X, 32HNUMBER OF INTERVALS IN MISSION =, I5)       INAD101
                 NSI = NS(I)                                            INAD105
                 DO  270 J = 1, NSI                                     INAD1051
                 WRITE (6,260) J                                        INAD1052
     260   FORMAT (/10X, 19HMISSION INTERVAL NO, I5)                    INAD1053
                 WRITE (6,265)                                          INAD1054
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  265 FORMAT ( 10X, 11HINTERVAL NO, 2X, 13HFLT LOADS/FLT, 4X,           INAD1055
     1 11HINTERVAL NO, 2X, 13HFLT LOADS/FLT, 4X, 11HINTERVAL NO, 2X,    INAD1056
     2 13HFLT LOADS/FLT )                                               INAD1057
      DO 270 K = 1, NMIMB, 3                                            INAD1061
      KP1 = K + 1                                                       INAD1062
      KP2 = K + 2                                                       INAD1063
  270 WRITE (6,280) K, NFF(K,I,J), KP1, NFF(KP1,I,J),                   INAD1064
     1 KP2, NFF(KP2,I,J)                                                INAD1065
  280 FORMAT (I21, 5I15)                                                INAD1066
      WRITE (6,290) NLTF(I)                                             INAD110
  290 FORMAT (/10X, 34HLANDING TAXI MAXIMUMS PER FLIGHT =, I5)          INAD111
      WRITE (6,300) NTG(I)                                              INAD112
  300 FORMAT (/10X, 44HNUMBER OF TOUCH-AND-GO LANDINGS PER FLIGHT =,    INAD113
     1 I5)                                                              INAD1131
      GO TO (310,330), NTEMP(I)                                         INAD114
  310 WRITE (6,320)                                                     INAD115
  320 FORMAT (/10X, 32HTEMPERATURE PROFILE NOT INCLUDED)                INAD116
      GO TO 350                                                         INAD117
  330 WRITE (6,340)                                                     INAD118
  340 FORMAT (/10X, 28HTEMPERATURE PROFILE INCLUDED)                    INAD119
  350 WRITE (6,360) SH(I)                                               INAD120
  360 FORMAT (/10X, 42HSTRESS AT REST IN TAKE-OFF CONFIGURATION =,      INAD121
     1 F11.0)                                                           INAD122
      WRITE (6,370)                                                     INAD123
  370 FORMAT (/10X, 35HTAKE-OFF TAXI MAXIMUM LOAD SPECTRUM              INAD124
     1 //10X, 6HSTRESS)                                                 INAD125
      MTTPI = MTTP(I)                                                   INAD126
      WRITE (6,380) (STTP(I,J), J = 1, MTTPI)                           INAD127
  380 FORMAT (10F11.0)                                                  INAD128
      WRITE (6,390)                                                     INAD129
  390 FORMAT ( 10X, 36HNUMBER OF OCCURRENCES AT EACH STRESS)            INAD130
      WRITE (6,400) (NTTP(I,J), J = 1, MTTPI)                           INAD131
  400 FORMAT (10I11)                                                    INAD132
      WRITE (6,410)                                                     INAD133
  410 FORMAT (/10X, 35HTAKE-OFF TAXI MINIMUM LOAD SPECTRUM              INAD134
     1 //10X, 6HSTRESS)                                                 INAD135
      MTTNI = MTTN(I)                                                   INAD136
      WRITE (6,380) (STTN(I,J), J = 1, MTTNI)                           INAD137
      WRITE (6,390)                                                     INAD138
      WRITE (6,400) (NTTN(I,J), J = 1, MTTNI)                           INAD139
      NPAGE = NPAGE + 1                                                 INAD140
      CALL PAGEHD                                                       INAD141
      WRITE (6,230) I                                                   INAD1411
      DO 500 J = 1, NBI                                                 INAD142
      WRITE (6,420) J                                                   INAD143
  420 FORMAT (/10X, 28HFLIGHT MAXIMUM LOAD SPECTRUM                     INAD144
     1 /10X, 15HINTERVAL NUMBER, I5                                     INAD145
     2 //10X, 6HSTRESS)                                                 INAD146
      MFPIJ = MFP(I,J)                                                  INAD147
      WRITE (6,380) (SFP(I,J,K), K = 1, MFPIJ)                          INAD148
      WRITE (6,390)                                                     INAD149
      WRITE (6,400) (NFP(I,J,K), K = 1, MFPIJ)                          INAD150
      WRITE (6,430) J                                                   INAD151
  430 FORMAT (/10X, 28HFLIGHT MINIMUM LOAD SPECTRUM                     INAD152
     1 /10X, 15HINTERVAL NUMBER, I5                                     INAD153
     2 //10X, 6HSTRESS)                                                 INAD154
      MFNIJ = MFN(I,J)                                                  INAD155
```

```
            WRITE (6,380) (SFN(I,J,K), K = 1, MFNIJ)                    INAD156
            WRITE (6,390)                                               INAD157
            WRITE (6,400) (NFN(I,J,K), K = 1, MFNIJ)                    INAD158
            WRITE (6,440) J                                             INAD159
  440 FORMAT (//10X, 26HFLIGHT ONE G LOAD SPECTRUM                      INAD160
     1        //10X, 15HINTERVAL NUMBER, I5                             INAD161
     2        //10X,  6HSTRES8)                                         INAD162
            MFGIJ = MFG(I,J)                                            INAD163
            WRITE (6,380) (SFG(I,J,K), K = 1, MFGIJ)                    INAD164
            WRITE (6,390)                                               INAD165
            WRITE (6,400) (NFG(I,J,K), K = 1, MFGIJ)                    INAD166
            GO TO (475,450), NTEMP(I)                                   INAD167
  450       WRITE (6,460) J                                             INAD168
  460 FORMAT (//10X, 27HFLIGHT TEMPERATURE SPECTRUM                     INAD169
     1        //10X, 15HINTERVAL NUMBER, I5                             INAD170
     2        //10X, 11HTEMPERATURE )                                   INAD171
            MFIJ = MF(I,J)                                              INAD172
            WRITE (6,380) (TF(I,J,K), K = 1, MFIJ)                      INAD173
            WRITE (6,470)                                               INAD174
  470 FORMAT ( 10X, 41HNUMBER OF OCCURRENCES AT EACH TEMPERATURE)       INAD175
            WRITE (6,400) (NF(I,J,K), K = 1, MFIJ)                      INAD176
  475       IF (J-NSI) 480, 500                                         INAD177
  480       NPAGE = NPAGE + 1                                           INAD178
            CALL PAGEND                                                 INAD179
            WRITE (6,230) I                                             INAD1791
  500       CONTINUE                                                    INAD180
            NPAGE = NPAGE + 1                                           INAD181
            CALL PAGEND                                                 INAD182
            WRITE (6,230) I                                             INAD1821
            IF (MTG(I)) 510, 540                                        INAD183
  510       WRITE (6,520)                                               INAD184
  520 FORMAT (//10X, 41HTOUCH-AND-GO LANDING IMPACT LOAD SPECTRUM       INAD185
     1        //10X,  6HSTRES8)                                         INAD186
            MTGII = MTGI(I)                                             INAD187
            WRITE (6,380) (STGI(I,J), J = 1, MTGII)                     INAD188
            WRITE (6,390)                                               INAD189
            WRITE (6,400) (NTGI(I,J), J = 1, MTGII)                     INAD190
            WRITE (6,530)                                               INAD191
  530 FORMAT (//10X, 35HTOUCH-AND-GO LANDING ONE G SPECTRUM             INAD192
     1        //10X,  6HSTRES8)                                         INAD193
            MTGGI = MTGG(I)                                             INAD194
            WRITE (6,380) (STGG(I,J), J = 1, MTGGI)                     INAD195
            WRITE (6,390)                                               INAD196
            WRITE (6,400) (NTGG(I,J), J = 1, MTGGI)                     INAD197
  540       WRITE (6,550)                                               INAD198
  550 FORMAT (//10X, 30HLANDING IMPACT LOAD SPECTRUM                    INAD199
     1        //10X,  6HSTRES8)                                         INAD200
            MLII = MLI(I)                                               INAD201
            WRITE (6,380) (SLI(I,J), J = 1, MLII)                       INAD202
            WRITE (6,390)                                               INAD203
            WRITE (6,400) (NLI(I,J), J = 1, MLII)                       INAD204
            WRITE (6,560)                                               INAD205
  560 FORMAT (//10X, 34HLANDING TAXI MAXIMUM LOAD SPECTRUM              INAD206
     1        //10X,  6HSTRES8)                                         INAD207
            MLTPI = MLTP(I)                                             INAD208
            WRITE (6,380) (SLTP(I,J), J = 1, MLTPI)                     INAD209
            WRITE (6,390)                                               INAD210
```

```
                  WRITE (6,400) (NLTP(I,J), J = 1, NLTPI)                  INAD211
  230             WRITE (6,570)                                            INAD212
            570   FORMAT (/10X, 30HLANDING TAXI MINIMUM LOAD SPECTRUM      INAD213
              1      //10X,  6HSTRESS)                                     INAD214
                  NLTNI = NLTN(I)                                          INAD215
                  WRITE (6,380) (SLTN(I,J), J = 1, NLTNI)                  INAD216
  235             WRITE (6,390)                                            INAD217
                  WRITE (6,400) (NLTN(I,J), J = 1, NLTNI)                  INAD218
                  WRITE (6,580) TL                                         INAD219
            580   FORMAT (/10X, 30HGROUND CONDITION TEMPERATURE =, F9.0)   INAD220
            590   CONTINUE                                                 INAD221
  240             NZERO = 1                                                INAD2211
                  RETURN                                                   INAD222
                  END                                                      INAD223
```

```
                  SUBROUTINE COMP                                              COMP   1
C        SUBROUTINE FOR TESTING COMPATIBILITY OF INPUT DATA                    COMP   2
                  COMMON P(13000), N(13500)                                    COMP   3
                  DIMENSION NITP(12,20), NTIN(12,20), NFP(12,10,20),           COMP   4
         1        NFN(12,10,20), NFG(12,10,20), NLI(12,20), NLTP(12,20),       COMP   5
         2        NLTN(12,20), NF(12,10,20), NTGI(12,20), NTGG(12,20),         COMP   6
         3        MTIP(12), MITN(12), MFP(12,10), MFN(12,10), MFG(12,10),      COMP   7
         4        MLI(12), MLTP(12), MLTN(12), MF(12,10), MIGI(12), MTGG(12),  COMP   8
         5        NS(12), NIG(12), NTEMP(12), NTIP(12), NFF(3,12,10), NLTF(12), COMP   9
         6        MNUM(50), NUMRPT(50), NFRAC(3,12,10), NUMML(12)              COMP  10
                  EQUIVALENCE (N(12), NM), (N(13), NRANM),                     COMP  11
         1        (N(15), NMTMS), (N(16), NFLT), (N(17), NNMS), (N(18), MISRPT), COMP  12
         2        (N(19), MNUMS)                                               COMP  13
                  EQUIVALENCE (N(115), NTTP), (N(415), NTIN),                  COMP  14
         1        (N(715), NFP), (N(3115), NFN), (N(5515), NFG), (N(7915), NLI), COMP  15
         2        (N(8215), NLTP), (N(8515), NLIN), (N(8815), NF),             COMP  16
         3        (N(11215), NTGI), (N(11515), NTGG), (N(11815), MTIP),        COMP  17
         4        (N(11830), MTIN), (N(11845), MFP), (N(11965), MFN),          COMP  18
         5        (N(12085), MFG), (N(12205), MLI), (N(12220), MLTP),          COMP  19
         6        (N(12235), MLIN), (N(12250), MF), (N(12370), MTGI),          COMP  20
         7        (N(12385), MTGG), (N(12400), NS)                             COMP  21
                  EQUIVALENCE (N(12415), NTG), (N(12430), NTEMP),              COMP  22
         1        (N(12445), NTIP), (N(12460), NFF), (N(12820), NLTF),         COMP  23
         2        (N(12835), MNUM), (N(12885), NUMRPT), (N(12935), NFRAC),     COMP  24
         3        (N(13295), NUMML)                                            COMP  25
                  NCONT = 0                                                    COMP  26
                  DO 490 I = 1, NM                                             COMP  27
C        CHECK ON NUMBER OF TAKE-OFF TAXI MAXIMUMS IN ONE LIFETIME             COMP  28
                  MTTPI = MTTP(I)                                              COMP  29
                  NTEST = NUMML(I) * NTTP(I)                                   COMP  30
                  NCHK = 0                                                     COMP  31
                  DO 10 J = 1, MTTPI                                           COMP  32
   10             NCHK = NTTP(I,J) + NCHK                                      COMP  33
                  IF (NTEST - NCHK) 20, 40                                     COMP  34
   20             WRITE (6,30) I, NTEST, NCHK                                  COMP  35
   30    FORMAT (10X, 33HTAKE-OFF TAXI MAXIMUM CHECK ERROR, 4X,                COMP  36
         1        10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)      COMP  37
                  NCONT = 1                                                    COMP  38
C        CHECK ON NUMBER OF TAKE OFF TAXI MINIMUMS IN ONE LIFETIME             COMP  39
   40             MTTNI = MTTN(I)                                              COMP  40
                  NCHK = 0                                                     COMP  41
                  DO 50 J = 1, MTTNI                                           COMP  42
   50             NCHK = NTTN(I,J) + NCHK                                      COMP  43
                  IF (NTEST - NCHK) 60, 75                                     COMP  44
   60             WRITE (6,70) I, NTEST, NCHK                                  COMP  45
   70    FORMAT (10X, 33HTAKE-OFF TAXI MINIMUM CHECK ERROR, 4X,                COMP  46
         1        10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)      COMP  47
                  NCONT = 1                                                    COMP  48
C        CHECK ON NUMBER OF FLIGHT MAXIMUMS PER LIFETIME                       COMP  49
   75             NSI = NS(I)                                                  COMP  50
                  DO 240 J = 1, NSI                                            COMP  51
                  MFPIJ = MFP(I,J)                                             COMP  52
                  IF (NMTMS-1) 80, 90                                          COMP  53
   80             NTEST = 0                                                    COMP  54
                  DO 85 K = 1, NMTMS                                           COMP  55
   85             NTEST = NFF(K,I,J) * NFRAC(K,I,J) + NTEST                    COMP  56
                  GO TO 100                                                    COMP  57
```

```
   90       NTEST = NUMML(I) + NPF(I,I,J)                               COMP 58
  100       NCHK = 0                                                    COMP 59
            DO  110 K = 1, NFPIJ                                        COMP 60
  110       NCHK = NPP(I,J,K) + NCHK                                    COMP 61
            IF (NTEST - NCHK) 120, 140                                  COMP 62
  120       WRITE (6,130) I, J, NTEST, NCHK                             COMP 63
  130 FORMAT (10X, 26HFLIGHT MAXIMUM CHECK ERROR, 4X,                   COMP 64
     1          10HMISSION NO, I5, 2X, 19HMISSION INTERVAL NO, I5, 2X,  COMP 65
     2          7HNTEST =, I5, 2X, 6HNCHK =, I5)                        COMP 66
            NCONT = 1                                                   COMP 67
C     CHECK ON NUMBER OF FLIGHT MINIMUMS AND ONE GS PER LIFETIME        COMP 68
  140       NCHK = 0                                                    COMP 69
            NFNIJ = NFN(I,J)                                            COMP 70
            NFGIJ = NFG(I,J)                                            COMP 71
            DO  150 K = 1, NFNIJ                                        COMP 72
  150       NCHK = NFN(I,J,K) + NCHK                                    COMP 73
            DO  160 K = 1, NFGIJ                                        COMP 74
  160       NCHK = NFG(I,J,K) + NCHK                                    COMP 75
            IF (NTEST - NCHK) 170, 190                                  COMP 76
  170       WRITE (6,180) I, J, NTEST, NCHK                             COMP 77
  180 FORMAT (10X, 26HFLIGHT MINIMUM CHECK ERROR, 4X,                   COMP 78
     1          10HMISSION NO, I5, 2X, 19HMISSION INTERVAL NO, I5, 2X,  COMP 79
     2          7HNTEST =, I5, 2X, 6HNCHK =, I5)                        COMP 80
            NCONT = 1                                                   COMP 81
  190       GO TO (245,200), NTEMP(I)                                   COMP 82
C     CHECK ON NUMBER OF FLIGHT TEMPERATURE OCCURRENCES PER LIFETIME    COMP 83
  200       NCHK = 0                                                    COMP 84
            NFIJ = NF(I,J)                                              COMP 85
            DO  210 K = 1, NFIJ                                         COMP 86
  210       NCHK = NF(I,J,K) + NCHK                                     COMP 87
            IF (2 * NTEST - NCHK) 220, 240                              COMP 88
  220       WRITE (6,230) I, J, NTEST, NCHK                             COMP 89
  230 FORMAT (10X, 30HFLIGHT TEMPERATURE CHECK ERROR, 4X,               COMP 90
     1          10HMISSION NO, I5, 2X, 19HMISSION INTERVAL NO, I5, 2X,  COMP 91
     2          7HNTEST =, I5, 2X, 6HNCHK =, I5)                        COMP 92
            NCONT = 1                                                   COMP 93
  240       CONTINUE                                                    COMP 94
C     CHECK ON NUMBER OF LANDING IMPACTS PER LIFETIME                   COMP 95
  245       NTEST = NUMML(I)                                            COMP 96
            NCHK = 0                                                    COMP 97
            NLII = NLI(I)                                               COMP 98
            DO  250 J = 1, NLII                                         COMP 99
  250       NCHK = NLI(I,J) + NCHK                                      COMP100
            IF (NTEST - NCHK) 260, 280                                  COMP101
  260       WRITE (6,270) I, NTEST, NCHK                                COMP102
  270 FORMAT (10X, 24HLANDING IMPACT CHECK ERROR, 4X,                   COMP103
     1          10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5) COMP104
            NCONT = 1                                                   COMP105
C     CHECK ON NUMBER OF TOUCH-AND-GO IMPACTS PER LIFETIME              COMP106
            IF(NTG(I)) 280, 300                                         COMP107
  280       NTEST = NTG(I) * NUMML(I)                                   COMP108
            NCHK = 0                                                    COMP109
            NTGI = NTGI(I)                                              COMP110
            DO  290 J = 1, NTGI                                         COMP111
  290       NCHK = NTGI(I,J) + NCHK                                     COMP112
            IF (NTEST - NCHK) 300, 320                                  COMP113
  300       WRITE (6,310) I, NTEST, NCHK                                COMP114
```

```
      310 FORMAT (10X, 31HTOUCH-AND-GO IMPACT CHECK ERROR, 4X,          COMP115
         1      10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)COMP116
            NCONT = 1                                                  COMP117
      C   CHECK ON NUMBER OF TOUCH-AND-GO ONE G8 PER LIFETIME          COMP118
      320   NCHK = 0                                                   COMP119
            NTGGI = NTGG(I)                                            COMP120
            DO 330 J = 1, NTGGI                                        COMP121
      330   NCHK = NTGG(I,J) + NCHK                                    COMP122
            IF (NTEST - NCHK) 340, 360                                 COMP123
      340   WRITE (6,350) I, NTEST, NCHK                               COMP124
      350 FORMAT (10X, 30HTOUCH-AND-GO ONE G CHECK ERROR, 4X,           COMP125
         1      10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)COMP126
            NCONT = 1                                                  COMP127
      C   CHECK ON NUMBER OF LANDING TAXI MAXIMUMS PER LIFETIME         COMP128
      360   NTEST = NLTF(I) + NUMML(I)                                 COMP129
            NCHK = 0                                                   COMP130
            MLTPI = MLTP(I)                                            COMP131
            DO 370 J = 1, MLTPI                                        COMP132
      370   NCHK = NLTP(I,J) + NCHK                                    COMP133
            IF (NTEST - NCHK) 380, 400                                 COMP134
      380   WRITE (6,390) I, NTEST, NCHK                               COMP135
      390 FORMAT (10X, 32HLANDING TAXI MAXIMUM CHECK ERROR, 4X,         COMP136
         1      10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)COMP137
            NCONT = 1                                                  COMP138
      400   NCHK = 0                                                   COMP139
            MLTNI = MLTN(I)                                            COMP140
            DO 410 J = 1, MLTNI                                        COMP141
      410   NCHK = NLTN(I,J) + NCHK                                    COMP142
            IF (NTEST - NCHK) 420, 440                                 COMP143
      420   WRITE (6,430) I, NTEST, NCHK                               COMP144
      430 FORMAT (10X, 32HLANDING TAXI MINIMUM CHECK ERROR, 4X,         COMP145
         1      10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)COMP146
      C   CHECK ON NUMBER OF FLIGHTS                                   COMP147
      440   NTEST = NFLT                                               COMP148
            NCHK = 0                                                   COMP149
            DO 450 J = 1, NM                                           COMP150
      450   NCHK = NUMML(J) + NCHK                                     COMP151
            IF (NTEST - NCHK) 470, 490                                 COMP152
      470   WRITE (6,480) I, NTEST, NCHK                               COMP153
      480 FORMAT (10X, 25HFLIGHT NUMBER CHECK ERROR, 4X,                COMP154
         1      10HMISSION NO, I5, 2X, 7HNTEST =, I5, 2X, 6HNCHK =, I5)COMP155
            NCONT = 1                                                  COMP156
      490   CONTINUE                                                   COMP157
      500   IF (NCONT) 510, 520                                        COMP158
      510   CALL GUIDE                                                 COMP159
      520   RETURN                                                     COMP160
            END                                                        COMP161
```

```
      SUBROUTINE CALC
C     SUBROUTINE FOR GENERATING FLIGHT-BY-FLIGHT LOADS AND                CALC   1
C     TEMPERATURES                                                        CALC   2
      COMMON P(13060), N(13500)                                           CALC   3
      DIMENSION SH(12), STYP(12,20), STYN(12,20),                         CALC   4
     1 SFP(12,10,20), SFN(12,10,20), SFG(12,10,20), SLI(12,20),           CALC   5
     2 SLYP(12,20), SLYN(12,20), TF(12,10,20), STGI(12,20),               CALC   6
     3 STGG(12,20), STRESS(300), TEMP(300)                                CALC   7
      DIMENSION NTYP(12,20), NTYN(12,20), NFP(12,10,20),                  CALC   8
     1 NFN(12,10,20), NFG(12,10,20), NLI(12,20), NLYP(12,20),             CALC   9
     2 NLYN(12,20), NF(12,10,20), NTGI(12,20), NTGG(12,20),               CALC  10
     3 MTYP(12), MTYN(12), MFP(12,10), MFN(12,10), MFG(12,10),            CALC  11
     4 MLI(12), MLYP(12), MLYN(12), MF(12,10), MTGI(12), MTGG(12),        CALC  12
     5 NS(12), NTG(12), NTEMP(12), NTYF(12), NFF(3,12,10), NLYF(12),      CALC  13
     6 MNUM(50), NUMMPT(50), NFRAC(3,12,10), NUMML(12)                    CALC  14
      DIMENSION NFNG(20), SFNG(20)                                        CALC  15
      EQUIVALENCE (P(1), YL)                                              CALC 151
      EQUIVALENCE (P(101), SH), (P(115), STYP),                           CALC  16
     1 (P(415), STYN), (P(715), SFP), (P(3115), SFN), (P(5515), SFG),     CALC  17
     2 (P(7915), SLI), (P(8215), SLYP), (P(8515), SLYN),                  CALC  18
     3 (P(8815), TF), (P(11215), STGI), (P(11515), STGG),                 CALC  19
     4 (P(11815), STRESS), (P(12115), TEMP)                               CALC  20
      EQUIVALENCE (N(11), NCASE), (N(12), NN),                            CALC  21
     1 (N(13), NRANM), (N(15), NNYRS), (N(16), NFLY), (N(17), NNRS),      CALC  22
     2 (N(18), NTSRPT), (N(19), MNUMB)                                    CALC  23
      EQUIVALENCE (N(49), NPAGE)                                          CALC  24
      EQUIVALENCE (N(115), NTYP), (N(415), NTYN),                         CALC 241
     1 (N(715), NFP), (N(3115), NFN), (N(5515), NFG), (N(7915), NLI),     CALC  25
     2 (N(8215), NLYP), (N(8515), NLYN), (N(8815), NF),                   CALC  26
     3 (N(11215), NTGI), (N(11515), NTGG), (N(11815), MTYP),              CALC  27
     4 (N(11830), MTYN), (N(11845), MFP),  (N(11965), MFN),               CALC  28
     5 (N(12085), MFG), (N(12205), MLI), (N(12220), MLYP),                CALC  29
     6 (N(12235), MLYN), (N(12250), MF), (N(12370), MTGI),                CALC  30
     7 (N(12385), MTGG), (N(12400), NS)                                   CALC  31
      EQUIVALENCE (N(12415), NTG), (N(12430), NTEMP),                     CALC  32
     1 (N(12445), NTYF), (N(12460), NFF), (N(12820), NLYF),               CALC  33
     2 (N(12835), MNUM), (N(12885), NUMMPT), (N(12935), NFRAC),           CALC  34
     3 (N(13295), NUMML)                                                  CALC  35
C     SET INITIAL VALUE OF CONTROL INTEGERS                               CALC  36
      MNUM = 1                                                            CALC  37
      NRPT = 0                                                            CALC  38
      NMRPT= 0                                                            CALC  39
C     SET THE FLIGHT NUMBER EQUAL TO ONE                                  CALC  40
      NUMFLT = 1                                                          CALC  41
C     SELECT THE MISSION                                                  CALC  42
   10 GO TO (20, 90), NRANM                                               CALC  43
C     RANDOM MISSION SELECTION OPTION                                     CALC  44
   20 NPOSS = 0                                                           CALC  45
      DO   30 I = 1, NM                                                   CALC  46
   30 NPOSS = NUMML(I) + NPOSS                                            CALC  47
      X = RANF(1   )                                                      CALC  48
      NUMSEL = X * NPOSS + 1                                              CALC  49
      M = 0                                                               CALC  50
      DO   40 I = 1, NM                                                   CALC  51
      M = NUMML(I) + M                                                    CALC  52
      IF (NUMSEL - M) 50, 50, 40                                          CALC  53
   40 CONTINUE                                                            CALC  54
                                                                          CALC  55
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   50          NUMML(I) = NUMML(I) - 1                              CALC 56
               IF (NUMML(I)) 60, 80, 80                             CALC 57
   60          WRITE (6,70) I, NUMML(I)                             CALC 58
   70     FORMAT (10X, 18HERROR SIGNAL NO. I, 4X, 3HI =, I5, 4X,    CALC 59
        1 10HNUMML(I) =, I5)                                        CALC 60
               CALL GUIDE                                           CALC 601
   80          IMISS = I                                            CALC 61
               GO TO 170                                            CALC 62
C         NONRANDOM MISSION SELECTION OPTION                        CALC 63
   90          IMISS = MNUM(NNUM)                                   CALC 64
  100          NMRPT = NMRPT + 1                                    CALC 65
  110          IF (NMRPT - NUMMPT(NNUM)) 170, 120, 120              CALC 66
  120          NNUM = NNUM + 1                                      CALC 67
  130          NMRPT = 0                                            CALC 68
  140          IF (NNUM - MNUMS) 170, 170, 150                      CALC 69
  150          NRPT = NRPT + 1                                      CALC 70
  160          IF (NRPT - MISRPT) 161, 161, 165                     CALC 71
  161          NNUM = 1                                             CALC 711
               GO TO 170                                            CALC 712
  165          CALL GUIDE                                           CALC 713
C         MISSION BREAKDOWN XY CODE                                 CALC 72
C          X = 1  AIRCRAFT AT REST IN TAKE-OFF CONFIGURATION        CALC 73
C          X = 2  TAKE-OFF TAXI                                     CALC 74
C          X = 3  FLIGHT                                            CALC 75
C          X = 4  LANDING IMPACT                                    CALC 76
C          X = 5  LANDING TAXI                                      CALC 77
C          X = 6  TOUCH-AND-GO LANDING                              CALC 78
C          Y = 1  MAXIMUM OR TOUCH-AND-GO LANDING IMPACT            CALC 79
C          Y = 2  MINIMUM OR TOUCH-AND-GO ONE G                     CALC 80
C          Y = 3  TEMPERATURE                                       CALC 81
C         SELECT THE LOAD AND TEMPERATURE SEQUENCE FOR A FLIGHT FOR THIS CALC 82
C         MISSION                                                   CALC 83
  170          IL = 1                                               CALC 84
C         DEFINE LOAD AND TEMPERATURE FOR AIRCRAFT AT REST          CALC 85
               STRESS(IL) = SR(IMISS)                               CALC 86
               TEMP(IL) = TL                                        CALC 86
C         FORM THE TAKE-OFF TAXI LOAD SEQUENCE                      CALC 87
               NCTS = NTTF(IMISS)                                   CALC 88
               DO  180 I = 1, NCTS                                  CALC 89
C         SELECT A MAXIMUM TAKE-OFF TAXI LOAD                       CALC 90
               CALL SEARC2 (MTTP(IMISS), NTTP(I,1),      IMISS,     CALC 92
        1 0, 21, INT)                                               CALC 93
               IL = IL + 1                                          CALC 94
               STRESS(IL) = STTP(IMISS,INT)                         CALC 95
               TEMP(IL) = TL                                        CALC 96
C         SELECT A MINIMUM TAKE-OFF TAXI LOAD                       CALC 97
               CALL SEARC2 (MTTN(IMISS), NTTN(I,1),      IMISS,     CALC 98
        1 0, 22, INT)                                               CALC 99
               IL = IL + 1                                          CALC100
               STRESS(IL) = STTN(IMISS,INT)                         CALC101
  180          TEMP(IL) = TL                                        CALC1012
C         FORM THE FLIGHT LOAD SEQUENCE                             CALC1020
               NJ = NS(IMISS)                                       CALC1021
               DO  240 J = 1, NJ                                    CALC1022
C         CHECK FOR RANDOM TIME INTERVALS                           CALC1023
               IF (NPTMS - 1) 182, 181                              CALC1024
  181          INT = 1                                              CALC1026
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                GO TO 168                                          CALC1028
      C     SELECT THE RANDOM MISSION TIME                         CALC1030
      182       NPOSS = 0                                          CALC1032
                DO  183 I = 1, NMTMS                               CALC1034
      183       NPOSS = NFRAC(I,IMISS,J) + NPOSS                   CALC1036
                X = RANF(1  )                                      CALC1038
                NUMSEL = X * NPOSS + 1                             CALC1040
                M = 0                                              CALC1042
                DO  184 I = 1, NMTMS                               CALC1044
                M = NFRAC(I,IMISS,J) + M                           CALC1046
                IF (NUMSEL - M) 185, 185, 184                      CALC1048
      184       CONTINUE                                           CALC1050
      185       NFRAC(I,IMISS,J) = NFRAC(I,IMISS,J) - 1            CALC1052
                IF (NFRAC(I,IMISS,J)) 186, 1871, 1871              CALC1054
      186       WRITE (6,187) I, NFRAC(I,IMISS,J)                  CALC1056
      187   FORMAT (10X, 18HERROR SIGNAL NO. 2, 4X, 3HI =, I5, 4X, CALC1058
          1 16HNFRAC(IMISS,J,I) =, I5)                             CALC1060
      1871      INT = I                                            CALC1062
      188       NCYS = NFF(INT,IMISS,J)                            CALC1064
                DO  240 I = 1, NCYS                                CALC1066
      C     SELECT A MAXIMUM FLIGHT LOAD AND TEMPERATURE           CALC1070
                CALL SEARC3 (NFP(IMISS,J), NFP(1,1,1),     IMISS,  CALC108
          1 J, 31, INT).                                           CALC109
                IL = IL + 1                                        CALC110
                STRESS(IL) = SFP(IMISS,J,INT)                      CALC111
                GO TO (190, 200), NTEMP(IMISS)                     CALC112
      190       TEMP(IL) = TL                                      CALC113
                GO TO 210                                          CALC114
      200       CALL SEARC3 (NF(IMISS,J), NF(1,1,1),     IMISS,    CALC115
          1 J, 33, INT)                                            CALC116
                TEMP(IL) = TF(IMISS,J,INT)                         CALC117
      C     SELECT A MINIMUM FLIGHT LOAD AND TEMPERATURE           CALC118
      C     FORM COMBINED NEGATIVE AND ONE G LOAD FUNCTIONS        CALC1182
      210       NFNG = NFN(IMISS,J) + NFG(IMISS,J)                 CALC1184
                NFNIJ = NFN(IMISS,J)                               CALC1186
                DO  212 K = 1, NFNIJ                               CALC1188
                NFNG(K) = NFN(IMISS,J,K)                           CALC1190
      212       SFNG(K) = SFN(IMISS,J,K)                           CALC1192
                NFGIJ = NFG(IMISS,J)                               CALC1194
                DO  214 K = 1, NFGIJ                               CALC1196
                NFNG(K+NFNIJ) = NFG(IMISS,J,K)                     CALC1198
      214       SFNG(K+NFNIJ) = SFG(IMISS,J,K)                     CALC1200
      215       CALL SEARC1 (NFNG, NFNG(1), IMISS,                 CALC1202
          1 J, 32, INT)                                            CALC1204
                IF (INT - NFN(IMISS,J)) 216, 216, 218              CALC1205
      216       NFN(IMISS,J,INT) = NFN(IMISS,J,INT) - 1            CALC1206
                GO TO 219                                          CALC1207
      218       NINT = INT - NFN(IMISS,J)                          CALC1208
                NFG(IMISS,J,NINT) = NFG(IMISS,J,NINT) - 1          CALC1209
      219       IL = IL + 1                                        CALC121
                STRESS(IL) = SFNG(INT)                             CALC122
                GO TO (220, 230), NTEMP(IMISS)                     CALC123
      220       TEMP(IL) = TL                                      CALC124
                GO TO 240                                          CALC125
      230       CALL SEARC3 (NF(IMISS,J), NF(1,1,1),     IMISS,    CALC126
          1 J, 33, INT)                                            CALC127
                TEMP(IL) = TF(IMISS,J,INT)                         CALC128
```

```
  240          CONTINUE                                                CALC129
C      CHECK FOR TOUCH-AND-GO LANDING SEQUENCE                         CALC130
  250          IF (NTG(IMISS)) 260, 280                                CALC131
C      FORM THE TOUCH-AND-GO LANDING LOAD SEQUENCE                     CALC132
  260          NTAG = NTG(IMISS)                                       CALC133
               DO  270 I = 1, NTAG                                     CALC134
C      SELECT A TOUCH-AND-GO LANDING IMPACT LOAD                       CALC135
               CALL SEARC2 (NTGI(IMISS), NTGI(1,I),      IMISS,        CALC136
     1  0, 61, INT)                                                    CALC137
               IL = IL + 1                                             CALC138
               STRESS(IL) = STGI(IMISS,INT)                            CALC139
               TEMP(IL) = TL                                           CALC140
C      SELECT A TOUCH-AND-GO LANDING ONE G LOAD                        CALC141
               CALL SEARC2 (NTGG(IMISS), NTGG(1,I),      IMISS,        CALC142
     1  0, 62, INT)                                                    CALC143
               IL = IL + 1                                             CALC144
               STRESS(IL) = STGG(IMISS,INT)                            CALC145
               TEMP(IL) = TL                                           CALC146
  270          CONTINUE                                                CALC147
C      SELECT LANDING IMPACT LOAD                                      CALC148
  280          CALL SEARC2 (NLI(IMISS), NLI(1,1),      IMISS,          CALC149
     1  0, 4, INT)                                                     CALC150
               IL = IL + 1                                             CALC151
               STRESS(IL) = SLI(IMISS,INT)                             CALC152
               TEMP(IL) = TL                                           CALC153
C      FORM THE LANDING TAXI LOAD SEQUENCE                             CALC154
               NCTS = NLTP(IMISS)                                      CALC155
               DO  290 I = 1, NCTS                                     CALC156
C      SELECT A MAXIMUM LANDING TAXI LOAD                              CALC157
               CALL SEARC2 (NLTP(IMISS), NLTP(1,I),      IMISS,        CALC158
     1  0, 51, INT)                                                    CALC159
               IL = IL + 1                                             CALC160
               STRESS(IL) = SLTP(IMISS,INT)                            CALC161
               TEMP(IL) = TL                                           CALC162
C      SELECT A MINIMUM LANDING TAXI LOAD                              CALC163
               CALL SEARC2 (NLTN(IMISS), NLTN(1,I),      IMISS,        CALC164
     1  0, 52, INT)                                                    CALC165
               IL = IL + 1                                             CALC166
               STRESS(IL) = SLTN(IMISS,INT)                            CALC167
               TEMP(IL) = TL                                           CALC168
  290          CONTINUE                                                CALC169
C      WRITE OUT THE FLIGHT LOAD AND TEMPERATURE SEQUENCE              CALC170
               NPAGE = NPAGE + 1                                       CALC171
               CALL PAGEHD                                             CALC172
               WRITE (6,295)                                           CALC173
  295  FORMAT(//10X, 46HFLIGHT-BY-FLIGHT LOAD AND TEMPERATURE SEQUENCE)CALC174
               WRITE (6,300) NUMFLT, IMISS, IL                         CALC175
  300  FORMAT (10X, 15HFLIGHT NUMBER =, I5 /                           CALC176
     1         10X, 16HMISSION NUMBER =, I5 /                          CALC177
     2         10X, 17HNUMBER OF LOADS =, I5, //)                      CALC178
               WRITE (6,320)                                           CALC179
  320  FORMAT (9X, 11HLOAD NUMBER, 4X, 6HSTRESS, 6X, 4HTEMP, 9X,       CALC180
     1  11HLOAD NUMBER, 4X, 6HSTRESS, 6X, 4HTEMP, 9X, 11HLOAD NUMBER,  CALC181
     2  4X, 6HSTRESS, 6X, 4HTEMP)                                      CALC182
               DO  330 I = 1, IL, 3                                    CALC183
  330          WRITE (6,340) I, STRESS(I), TEMP(I),                    CALC184
     1  I+1, STRESS(I+1), TEMP(I+1), I+2, STRESS(I+2), TEMP(I+2)      CALC185
```

```
  340   FORMAT(I20, F10.0, F(0.0, I20, F10.0, F10.0, I20, F10.0, F10.0)CALC186
              IF (NUMFLT - NFLT) 350, 360, 360                         CALC187
                                                                       CALC188
  350         NUMFLT = NUMFLT + 1                                      CALC189
              GO TO 10                                                 CALC190
  360         CALL GUIDE                                               CALC191
              RETURN                                                   CALC192
              END
```

```
            SUBROUTINE SEARC1 (MCNT, NSEG, NB, NC, NXY, INT)         SRCH  1
C     SUBROUTINE FOR LOCATING THE INTERVAL ASSOCIATED WITH THE        SRCH  2
C     RANDOM LOAD OR TEMPERATURE SELECTION                            SRCH  3
            DIMENSION NSEG(20)                                         SRCH  4
C     COMPUTE THE INTERVAL FOR THE RANDOM SELECTION                   SRCH  5
            NTSEG = 0                                                  SRCH  6
            DO  10 I = 1, MCNT                                         SRCH  7
   10       NTSEG =  SEG(I) + NTSEG                                    SRCH  8
            IF (NTSE  ) 20, 40, 40                                     SRCH  9
   20       WRITE (6,30) NXY, NB, NC                                   SRCH 10
   30 FORMAT (10X, 20HNTSEG LESS THAN ZERO, 4X, 5HNXY =, I5,            SRCH 11
     1 4X, 4HNB =, I5, 4X, 4HNC =, I5)                                 SRCH 12
C     MAKE RANDOM SELECTION FROM INTERVAL 1 TO NTSEG                  SRCH 14
   40       X = RANF(1  )                                              SRCH 15
            NTSEL = X * NTSEG + 1                                      SRCH 16
C     LOCATE SEGMENT CORRESPONDING TO NTSEL                           SRCH 17
            M = 0                                                      SRCH 18
            DO  50 I = 1, MCNT                                         SRCH 19
            M = NSEG(I) + M                                            SRCH 20
            IF (NTSEL - M) 60, 60, 50                                  SRCH 21
   50       CONTINUE                                                   SRCH 22
C     REMOVE SELECTED MEMBER FROM POPULATION                          SRCH 23
   60       NSEG(I) = NSEG(I) - 1                                      SRCH 24
            IF (NSEG(I)) 70, 90, 90                                    SRCH 25
   70       WRITE (6,80) I, NSEG(I), NXY, NB, NC, MCNT                 SRCH 26
   80 FORMAT (10X, 12HERROR SIGNAL, 4X, 3HI =, I5, 4X, 9HNSEG(I) =,     SRCH 27
     1 I5, 4X, 5HNXY =, I5, 4X, 4HNB =, I5, 4X, 4HNC =, I5, 4X,        SRCH 28
     2 6HMCNT =, I5 )                                                  SRCH 281
   90       INT = I                                                    SRCH 29
            RETURN                                                     SRCH 30
            END                                                        SRCH 31
```

```
                  SUBROUTINE SEARC2 (MCNT, NSEG,      NB, NC, NXY,  SRCH   1
         1        INT)                                              SRCH  11
C        SUBROUTINE FOR LOCATING THE INTERVAL ASSOCIATED WITH THE   SRCH   2
C        RANDOM LOAD OR TEMPERATURE SELECTION                       SRCH   3
                  DIMENSION NSEG(12,20)                             SRCH   4
C        COMPUTE THE INTERVAL FOR THE RANDOM SELECTION              SRCH   5
                  NTSEG = 0                                         SRCH   6
                  DO  10 I = 1, MCNT                                SRCH   7
   10             NTSEG = NSEG(NB,I) + NTSEG                        SRCH   8
                  IF (NTSEG) 20, 40, 40                             SRCH   9
   20             WRITE (6,30) NXY, NB, NC                          SRCH  10
   30    FORMAT (10X, 20HNTSEG LESS THAN ZERO, 4X, 5HNXY =, I5,     SRCH  11
         1        4X, 4HNB =, I5, 4X, 4HNC =, I5)                   SRCH  12
C        MAKE RANDOM SELECTION FROM INTERVAL 1 TO NTSEG             SRCH  14
   40             X = RANF(1  )                                     SRCH  15
                  NTSEL = X * NTSEG + 1                             SRCH  16
C        LOCATE SEGMENT CORRESPONDING TO NTSEL                      SRCH  17
                  M = 0                                             SRCH  18
                  DO  50 I = 1, MCNT                                SRCH  19
                  M = NSEG(NB,I) + M                                SRCH  20
                  IF (NTSEL - M) 60, 60, 50                         SRCH  21
   50             CONTINUE                                          SRCH  22
C        REMOVE SELECTED MEMBER FROM POPULATION                     SRCH  23
   60             NSEG(NB,I) = NSEG(NB,I) - 1                       SRCH  24
                  IF (NSEG(NB,I)) 70, 90, 90                        SRCH  25
   70             WRITE (6,80) I, NSEG(NB,I), NXY, NB, NC, MCNT     SRCH  26
   80    FORMAT (10X, 12HERROR SIGNAL, 4X, 3HI =, I5, 4X,           SRCH  27
         1   12HNSEG(NB,I) =,   I5, 4X, 5HNXY =, I5, 4X, 4HNB =, I5, 4X,  SRCH  28
         2   4HNC =, I5, 4X, 6HMCNT =, I5)                          SRCH 281
   90             INT = I                                           SRCH  29
                  RETURN                                            SRCH  30
                  END                                               SRCH  31
```

```
                   SUBROUTINE SEARCH (MCNT, NSEG,        NB, NC,       SRCH   1
         1   NXY, INT)                                                 SRCH  11
C        SUBROUTINE FOR LOCATING THE INTERVAL ASSOCIATED WITH THE      SRCH   2
C        RANDOM LOAD OR TEMPERATURE SELECTION                          SRCH   3
                   DIMENSION NSEG(12,10,20)                            SRCH   4
C        COMPUTE THE INTERVAL FOR THE RANDOM SELECTION                 SRCH   5
                   NTSEG = 0                                           SRCH   6
                   DO  10 I = 1, MCNT                                  SRCH   7
        10         NTSEG = NSEG(NB,NC,I) + NTSEG                       SRCH   8
                   IF (NTSEG) 20, 40, 40                               SRCH   9
        20         WRITE (6,30) NXY, NB, NC                            SRCH  10
        30   FORMAT (10X, 20HNTSEG LESS THAN ZERO, 4X, 5HNXY =, I5,    SRCH  11
         1   4X, 4HNB =, I5, 4X, 4HNC =, I5)                           SRCH  12
C        MAKE RANDOM SELECTION FROM INTERVAL 1 TO NTSEG                SRCH  14
        40         X = RANF(1 )                                        SRCH  15
                   NTSEL = X * NTSEG + 1                               SRCH  16
C        LOCATE SEGMENT CORRESPONDING TO NTSEL                         SRCH  17
                   M = 0                                               SRCH  18
                   DO   50 I = 1, MCNT                                 SRCH  19
                   M = NSEG(NB,NC,I) + M                               SRCH  20
                   IF (NTSEL - M) 60, 60, 50                           SRCH  21
        50         CONTINUE                                            SRCH  22
C        REMOVE SELECTED MEMBER FROM POPULATION                        SRCH  23
        60         NSEG(NB,NC,I) = NSEG(NB,NC,I) - 1                   SRCH  24
                   IF (NSEG(NB,NC,I)) 70, 90, 90                       SRCH  25
        70         WRITE (6,80) I, NSEG(NB,NC,I), NXY, NB, NC, MCNT    SRCH  26
        80   FORMAT (10X, 12HERROR SIGNAL, 4X, 3HI =, I5, 4X,          SRCH  27
         1   15HNSEG(NB,NC,I) =, I5, 4X, 5HNXY =, I5, 4X, 4HNB =, I5, 4X,  SRCH  28
         2   4HNC =, I5, 4X, 6HMCNT =, I5)                             SRCH 281
        90         INT = I                                             SRCH  29
                   RETURN                                              SRCH  30
                   END                                                 SRCH  31
```

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                  SUBROUTINE PAGENO                                        PAGN  1
C          SUBROUTINE FOR NUMBERING THE PAGES AND IDENTIFYING THE RUN      PAGN  2
                  COMMON P(13000), N(13500)                                PAGN  3
                  INTEGER DAY, YEAR                                        PAGN  4
                  EQUIVALENCE (N(1), IDENT), (N(8), MONTH),                PAGN  5
             1    (N(9), DAY), (N(10), YEAR), (N(40), NPAGE)               PAGN  6
                  WRITE (6,10) IDENT, MONTH, DAY, YEAR, NPAGE              PAGN  7
        10        FORMAT (1H1, 9X, 6HRUN NO, I6, 10X, 6HDATE, I4, 1H/, I2, 1H/, PAGN  8
             1    I4, 10X, 7HPAGE NO, I6)                                  PAGN  9
                  RETURN                                                   PAGN 10
                  END                                                      PAGN 11
```